

**AN INVESTIGATION OF THE RELATIONSHIP BETWEEN SCHOOL SIZE,
SOCIO-ECONOMIC STATUS, EXPENDITURE-PER-STUDENT, MOBILITY RATE,
AND PERCENTAGE OF NON-WHITE SECONDARY STUDENTS TAKING STATE
SCIENCE EXAMS**

A Record of Study

by

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Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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August 2015

Major Subject: Educational Administration

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ABSTRACT

The achievement gap in American schools is an issue that educators have struggled with for years. This record of study is an examination of the relationship between school size, socio-economic status, expenditure-per-student, mobility rate, and percentage of non-White secondary students taking state or national science exams. It includes three journal-ready publications. The first journal-ready publication was a modified best-evidence synthesis and the second was a path analysis. The third journal-ready publication was a policy brief that included results from both studies as well as recommendations for policy makers, school administrators, and researchers.

The modified best-evidence synthesis demonstrated that all five variables that were part of the study had an impact of students' performance on state or national science exams. The results of the path analysis demonstrated that school size and per pupil expenditure had no impact of STAAR Biology student performance. Student socio-economic status, student mobility rate, and percentage of non-White students all had negative impacts on student performance on the STAAR Biology exam.

The overall results from this record of study shed light on the issues that exist in schools today. Policy makers, school administrators, and researchers can take the results as well as the recommendations and hopefully begin closing the achievement gap that exists today.

DEDICATION

I want to first dedicate this paper to my wife Kristy. We are best friends and I am lucky to have her. She has been by my side through all of this. She is an outstanding wife, best friend, mother, sister, aunt, counselor, daughter and anything else that she puts her mind to. Also, Rawling, my son, I love you more than you will ever know. I am the luckiest man alive because I have you. Kristy and Rawling, you two have stood beside me throughout this entire journey. I have hauled you guys all over the State of Texas and I appreciate you being there with me. Next, I dedicate it to my dad. My father taught me about life in many ways. The one thing that he did was get up and go to work without fail. He was the hardest worker I know. He loved us, worked hard, and did it all with a smile on his face. He did love his family, hunting, and food! Next, my mom has shown me what it is like to be a tough but loving person. I would not be where I am without you. I am thankful that this process is FINALLY over! I love all of you.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Irby, and my committee members, Dr. Torres, Dr. Sandlin, Dr. Tong, for their guidance and support throughout the course of this research. Dr. Irby, your tough love has been the only way that I have gotten through this. I am the world's worst procrastinator but you do a very good job a telling me to get to work. Throughout this entire writing process you have answered phone calls, text messages, emails, and Facebook messages as well. I appreciate everything and I am glad that you were my chair. Dr. Torres, I know you have been with me since the beginning of coursework and wondered if I would ever finish. Thank you for putting up with me and questioning me when a question needed to be asked. Dr. Sandlin, I want to tell you thank you for helping me along. The day we met in stats we hit it off and you have been there to help me no matter the question. Dr. Tong, thank you for coming on board and helping me through the stats and this process as well.

To the rest of the faculty, you all impacted my life more than you will ever know. All of the relationships and advice will last a lifetime in my opinion. Thank you all! To all the members of our cohort, thank you so much! Ryan, Pam, and Grady, I enjoyed working with each of you at some point. You all taught me so much in regard to life and leading a school as well. Everyone else, I enjoyed sitting in Harrington Tower with all of you on the Saturdays and growing as educators. I appreciate it all!

My family is the one group that has supported me, pushed me, asked me when I was going to finish that paper, and most of all loved me through this endeavor. Rawling, you spent many Saturdays and Sundays with me at my office watching videos, playing

games, and goofing around with me. I love you for that, and I really enjoyed it, but I am glad that we will get to start hanging out more doing things that involve us actually interacting with each other. Finally, Kristy, I know you are proud of me. I love you and thank you for holding my hand through this process. You will get your husband back. I love you baby!

I read the following quote one Sunday when I was writing and it hit hard. “The longer it takes you, the stronger it makes you.” This is very true with this process and I appreciate everyone bearing with me. I promise I will be a better dad, husband, son, brother, and person all around now that I can focus on the following more: God, family, work, and friends.

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CHAPTER I

INTRODUCTION

“The achievement gap, the persistent disparity between the performance of African American and Hispanic student and that of white and Asian American students, is perhaps the most stubborn, perplexing issue confronting American schools today” (Evans, 2005, p. 582). The face of the average student in Texas public schools has changed dramatically in the past 15 years (Texas Education Agency, 1998, 2013a). The number of standardized tests that students must pass has increased, and the impact those tests have on students’ academic progress has been amplified (Archibald, 2006; Texas Education Agency, 1998, 2013a). As a result, there are students that are struggling to pass these exams, and when they do not pass, they fall behind their counterparts. Educators across the State of Texas and the United States are struggling to find ways to help these students achieve and graduate from high school.

Statement of the Problem

In 1998, there were 3,891,877 students enrolled in public schools in the state of Texas (Texas Education Agency, 1998). Thirty-eight percent of these students were Hispanic¹; 14% of these students were African-American; 45% of these students were White; and 49% of these students were economically-disadvantaged (Texas Education Agency, 1998). From 1998 to 2012, there was an increase of 1,086,243 students to bring the total number of student to 4,978,120 students in the state of Texas (Texas Education Agency, 1998, 2013a). Fifty-one percent of these students were Hispanic; 13% of these

¹ The term Hispanic is used instead of Latina/o because this is the term the State of Texas uses in the Academic Excellence Indicator System (AEIS) reports.

students were African-American; 31% of these students were White, and 60% of these students were economically-disadvantaged (Texas Education Agency, 2013a). Clearly, these numbers demonstrate that in just fifteen years the population of students enrolled in public schools in the state of Texas has changed significantly. In fact, there has been an increase of approximately 1.09 million students with a 13% increase in the Hispanic student population alone. The African-American population has decreased by 1%, and the White population has decreased by 14%. During the same 15-year span, the number of economically-disadvantaged students has increased from 49% to 60% for a total increase of 11 percentage points (Texas Education Agency, 1998, 2013a). Murdock (2010) stated that by the year 2020, the majority of high school students in the United States will be students of color and students living in poverty (traditionally marginalized students). This, along with the previous data, demonstrates that the needs of all students are widespread and cannot be met by continuing to address only the needs of the traditional, predominantly White, middle-class group of students. Because demographics of students in schools have changed, while many instructional practices have not, achievement gaps between student groups have become not only a reality, but a serious concern (Research Center, 2011; Robinson, Lloyd, & Rowe, 2008).

Purpose of the Study

My record of study is comprised of three journal-ready publications. The first purpose of the study was to examine the relationship among school size, socio-economic status, expenditure-per-student, mobility-rate, and the percentage of non-traditional students' exam performance to traditional students' exam performance. The study was

completed through a modified best evidence synthesis and a resultant model that depicts the relationship among all the variables; the results constitute the first paper. The second purpose of my study was to identify the inter-correlation between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students on ninth grade students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance and the impact of such inter-correlation on students' STAAR Biology achievement through a path analysis study; the results of this analysis will constitute the second paper. The third paper relates the information to practice for use by policymakers and will be published in a practitioner journal.

Significance of the Study

My findings should provide information to administrators and teachers related to the high school size and student performance on Texas state-mandated tests in Texas secondary public schools. It may be determined that high school size may have a relationship to the success of students in the state of Texas. My findings may guide educators and decision makers when considering campus size at the secondary level. With decreases of the educational budgets across the state of Texas (Ginn, 2013), it is best that all decision makers be armed with the necessary knowledge to make decisions that will benefit the students in Texas, and my findings should provide a piece of that knowledge base.

Definition of Key Terms

Academic Excellence Indicator System (AEIS)

The AEIS report is published by the Texas Education Agency (TEA) yearly to assess all schools and school districts in the state of Texas as measured by the Texas Assessment of Knowledge and Skills (TAKS) (Texas Education Agency, 2013g) . The information is open to the public. Other indicators one the AEIS report are attendance rates, annual dropout rates, completion rates, and college readiness indicators (Texas Education Agency, 2012a). The results are disaggregated by ethnicity, special education, low income status, limited English proficient status, at-risk status, and by bilingual/ESL (Texas Education Agency, 2013g). The AEIS report also includes information on school and district staff, financial information, program and student demographic information (Texas Education Agency, 2013g).

Academic Performance

For the purpose of this study, academic performance was defined as the student passing rates on the 9th grade State of Texas Assessments of Academic Readiness (STAAR) Biology test 2012-2103 school years.

Economically Disadvantaged

A student who is eligible for free or reduced-price lunch or eligible for other public assistance, as defined in the Texas Education Agency's Public Education Information Management System (PEIMS) Data Standards. Eligibility for free or reduced-price lunch or other public assistance is reported for each student at the time of

enrollment and is used as a proxy for economically disadvantaged status (Texas Education Agency, 2012a).

Expenditure-Per-Student

Average per-pupil expenditure equals the total amount of revenue paid out by school systems in the state divided by K-12 total enrollment. It includes funds from federal, state, and local sources spent on day to day operating expenses, such as teacher salaries. It does not include capital expenses, such as school construction (“Common Core of Data at the National Center for Education Statistics Website,” 2011).

Mobility Rate

A student is considered to be mobile if he or she has been in membership at the school for less than 83% of the school year (i.e., has missed six or more weeks at a particular school). To determine a campus mobility rate the state of Texas divides the number of mobile students by the number of students that were in membership at any time during a school year (Texas Education Agency, 2012a).

State of Texas Assessment of Academic Readiness (STAAR)

In spring 2012, the State of Texas Assessments of Academic Readiness (STAAR) replaced the Texas Assessment of Knowledge and Skills (TAKS). The STAAR program includes annual assessments for grades 3–8 in reading and mathematics; assessments in writing at grades 4 and 7; in science at grades 5 and 8; and in social studies at grade 8; and end-of-course (EOC) assessments for English I, English II, Algebra I, Biology and U.S. History. Additionally, STAAR EOC assessments for

English III and Algebra II will be administered on a voluntary basis beginning in Spring 2016 (Texas Education Agency, 2013b).

STAAR Biology

Ninth grade students in the State of Texas are required to take the STAAR Biology assessment. The purpose of this exam is to measure their knowledge of the Biology curriculum for the state of Texas. The ninth grade STAAR Biology assessment is comprised of five reporting categories. These categories are cell structure and function, mechanisms of genetics, biological evolution and classification, biological processes and systems, and interdependence within environmental systems (Texas Education Agency, 2013e). The ninth grade STAAR Biology examination consists of 54 multiple choice questions (Texas Education Agency, 2013e).

STAAR Biology Passing Rate

In order to pass the STAAR Biology examination a student had to achieve a scale score of 3,367 (Texas Education Agency, 2013f). The number of items on the examination was 54 multiple choice items (Texas Education Agency, 2013f). The number of items correct required to meet the phase-in level 1 was 20. A student had to get only 26 answers correct to achieve phase-in level 2 standard (Texas Education Agency, 2013f). A student had to get 33 answers correct to score level II recommended on the STAAR Biology exam (Texas Education Agency, 2013f). For a student to score the highest level on the exam, level III advanced, a student had to get 45 answers correct (Texas Education Agency, 2013f).

Texas Assessment of Knowledge and Skills (TAKS)

The primary statewide testing program implemented in 2003 designed to measure the extent to which a student in grades 3-11 has learned and is able to apply the defined knowledge and skills at each tested grade level. A student must meet the standard on the four Grade 11 exit level TAKS tests to receive a high school diploma from a Texas public high school (Texas Education Agency, 2012a).

Limitations

The second study, the path analysis study component, is quantitative in nature and concentrated on the relationship between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students and their performance on the STAAR Biology exam in Texas secondary public schools. As a result, other factors were not investigated in this study and this limits the transferability of the results. A limitation of the second study is that the data included transfer students as well as students that had been at the school for their entire ninth grade year.

Delimitations

This overall study was delimited to Texas public high schools that report STAAR passing rates in Biology. High schools that have a grade span of 9-12 and are not alternative, private, or charter schools were included. Data were examined for one academic year, the 2012-2013 school year.

Assumptions

In this record of study, it was assumed that the quality of the data in the Texas Education Agency's reports are accurate and reflect the actual performance of the students. It was also assumed that if there are inaccuracies, they are consistent across all data and will impact the findings of this study equally. As a result, it is assumed that the quality of these data is accurate, because of the process that TEA used to validate the data (Texas Education Agency, 2013d).

Structure of the Study

This record of study is developed in a journal article format and will be organized into four chapters. Chapter I includes the introduction as well as the organizational setup for the entire dissertation. Chapters II and III will be formatted as journal articles, with Chapter IV will be written as a policy brief in which findings will be moved into the policy arena.

Chapter II-Journal Manuscript 1

The first component study, included as Chapter II, will be a modified best-evidence synthesis (Slavin, 1986, 1987) critique of the literature related to the relationship between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students taking state or national science exams. According to Slavin, (1986), "applications of best-evidence synthesis should at least make review procedures clear to the reader and should provide the reader with enough information about the primary research on which the review is based to reach independent conclusions" (p.10). The best-evidence synthesis method it will be

used to determine what studies are pertinent to my dissertation and include them in the review of literature.

The following databases were reviewed for studies, both quantitative and qualitative: (a) Education Full Text (H. W. Wilson), (b) Eric EBSCO (c) Google Scholar, (d) ProQuest Dissertations and Theses Full Text, and (e) JSTOR. Relationships were determined among the aforementioned variables and secondary school size and develop a theoretical model for testing. The research question was: To what extent can a theoretical model on secondary school size and science achievement related to socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students be developed for further testing?

Chapter III-Journal Manuscript 2

The second component study, included in Chapter III, was conducted as a path analysis study that tested the initial model created in Chapter II. The following variables were used in the path analysis which assessed secondary school size and science achievement: school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students at ninth grade level. The primary research question was: “To what extent do the moderating variables account for science achievement at ninth grade level when compared by school size?” The purpose of the path analysis was to explore the effects of school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students at ninth grade level on student performance on the STAAR Biology exam. The path analysis was accomplished by gathering data from the Texas Education Agency for the

2012-2013 school year for the STAAR Biology exam (Texas Education Agency, 2013e). All data was accessed from all high schools in the State of Texas that have a grade span of 9-12 and are not alternative, private, or charter schools.

In order to measure student success for this study, the student passing rates on the STAAR Biology test for the 2012-2103 school year were used as the determining factor. School size for the dissertation was established by using data from TEA about campus level results. This data will discuss variables that describe every student on that campus or in a certain student population. For the purpose of this record of study, socio-economic status is established for each campus by determining the percentage of students at each campus that are eligible for free or reduced lunch (Texas Education Agency, 2012a). Expenditure-per-student and mobility-rate are both derived for this dissertation from the data that was collected from TEA (Texas Education Agency, 2012a). The percentage of non-White students for each campus was determined by taking the percentage of White students and subtracting that percentage from 100 % (Texas Education Agency, 2012a).

Path analysis was used to determine the effect that socio-economic status has on percentage of non-White students, expenditure-per-student, mobility rate, and school size. Next factor explored was the effect that the above-mentioned variables have on the ninth grade student performance on the STAAR Biology exam. The effect that socio-economic status has on percentage of non-White students, expenditure-per-student, mobility rate, and school size was tested. Next, the effects of all of these variables on

ninth grade student performance was assessed on the STAAR Biology exam and the model was built accordingly.

Chapter IV-Journal Manuscript 3-Policy Brief

Chapter IV is another journal-ready manuscript submitted as a policy brief related to school size and science achievement and the related variables of school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-White secondary students. The policy brief was written in the format of University Council for Educational Administration (UCEA).

Chapter V-Summary

Chapter V summarizes the results of all of the journal ready manuscripts.

CHAPTER II

STUDENT ACHIEVEMENT RELATED TO SCHOOL SIZE, STUDENT SOCIO-ECONOMIC STATUS, PER PUPIL EXPENDITURES, STUDENT MOBILITY RATE, AND PERCENTAGE OF NON-WHITE STUDENTS: A MODIFIED BEST-EVIDENCE SYNTHESIS

Introduction

The importance placed on science instruction has changed drastically to become more thorough throughout the years (107th Congress of the United States of America, 2001a; American Association for the Advancement of Science, 1989, 1993, 2013; Jackson & Ash, 2012). The American Association for the Advancement of Science (AAAS) launched Project 2061 in 1985 (American Association for the Advancement of Science, 2013). Project 2061 is a long-term reform initiative designed to help all Americans become more literate in science, math, and technology. This was the beginning of the impetus in America to ensure that science instruction would change for the better. *Science for all Americans* was published by the AAAS in 1989 (American Association for the Advancement of Science, 1989). That report “defined science literacy and provided the groundwork for national science-education standards by outlining what students should know and be able to do in science by high school graduation” (Jackson & Ash, 2012, p. 724). In 1993, *Benchmarks for Science Literacy* was developed by the AAAS and included learning goals that aligned with *Science for all Americans* (American Association for the Advancement of Science, 1993). The purpose of that report was to help educators develop a scope and sequence for science

classes. The National Research Council (NRC) published the *National Science Educational Standards* in 1996 (National Research Council, 1996). According to the National Research Council (1996), the purpose of these standards was to “spell out a vision of science education that will make scientific literacy for all a reality in the 21st century. They pointed toward a destination and provide a roadmap for how to get there” (p. ix). All of these changes in the field of science led to changes in the importance level that educators placed on the field (Jackson & Ash, 2012).

The next major change in the field of education that took place was the passage of the No Child Left Behind (NCLB) Act of 2001 (107th Congress of the United States of America, 2001). This bill “requires that educators measure students’ yearly progress, encourages high academic standards, and implements greater accountability throughout the nation’s school system” (Jackson & Ash, 2012, p. 724). This bill forced all states to assess students’ science understanding on all levels in school yearly. As a result of the passage of NCLB, Texas made Science tested every year in the fifth and eighth grades (Texas Education Agency, 2013a). Also, in the 2011-2012 school year the State of Texas Assessments of Academic Readiness (STAAR) Biology exam became one of the science exams that all high school students in Texas have to pass in order to graduate from high school (Texas Education Agency, 2013e). This placed an added amount pressure on all high school students in the state of Texas in regard to the science curriculum.

The National Research Council of the National Academies established a committee to develop K-12 science educational standards and in 2012 they published *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core*

Ideas (National Research Council, 2012). This project helped to begin to align the science standards for the United States. The committee involved 41 individuals from 26 states. As a result of this, in April of 2013 the *Next Generation Science Standards* were published (National Research Council, 2013). These standards focused on developing students into college and career-ready levels of science preparedness. The standards were ready for states to begin using them for the 2013-2014 school year (National Research Council, 2013).

In the State of Texas, House Bill 5 was passed in 2013. As a result of this, the STAAR Biology exam became the only required Science exam that *all* high school students are required to pass in order to meet graduation requirements (Texas Education Agency, 2013c). In the 2010-2011 school year 76% of all students in the state of Texas passed the tenth grade Science TAKS test (Texas Education Agency, 2012b). On the same test, 66% of all Hispanic students, 62% of all African American students, 64% of all economically-disadvantaged students, lastly, 87% of all White students passed the test for a difference of 13% when compared to all students (Texas Education Agency, 2012b). In the 2011-2012 and 2012-2013 school years all 86% of all students in the state of Texas passed the STAAR Biology exam (Texas Education Agency, 2013a, 2013b). 81% of all Hispanic students, 82% of all African American, and 82% of all economically-disadvantaged students passed the same test. 94% of all White students passed the same test (Texas Education Agency, 2013a, 2013b). The fact that the exam must be passed in order to graduate from high school, coupled with the point that students that are Hispanic, African American, and economically disadvantaged

consistently perform below their White counterparts demonstrate a need for school personnel to assist these students to improve their science performance (Research Center, 2011; Robinson et al., 2008).

Review Methods

The best evidence synthesis (Slavin, 1986; 1987) approach was selected to review the literature; however, there were insufficient numbers of studies aligned with specific variables to conduct a best evidence synthesis. Therefore, that approach slightly modified in order to align with as many of the assumptions or principles of best evidence synthesis and in order to take a systematic approach to my review of literature. The systematic approach was suggested by Slavin (1986, 1987). When discussing the development of the best evidence process, Slavin, (1986) said, “the main idea behind this procedure, which is also called ‘best-evidence synthesis,’ is to add to the traditional scholarly literature review application of rational, systematic methods of selecting studies to be included and use of effect size (rather than statistical significance alone) as a common metric for treatment effects” (p. 7).

Since there was insufficient information for all the studies to determine the effect sizes, and since there were very few studies per variable, this systematic process was modified by including as many of the principles of best-evidence synthesis as promoted by Slavin. First, the most important principle of inclusion was included, which was that the published research must have germane-ness to the issue at hand (Slavin, 1986). In general, all studies included in the modified best-evidence synthesis contained a portion that was directly related to student testing. The second principle used was the

methodological adequacy of the studies to ensure that bias was minimized (Slavin, 1986); effect size was not used when it could be determined. The last principle used was a determination of the internal and external validity for each of the studies included (Slavin, 1986).

Criteria for Study Inclusion

According to Slavin (1987), studies on which a review is based must meet a set of *a priori* criteria with respect to germaneness and methodological adequacy. All studies in this review are directly related to student performance in American public schools grades 9-12 and where still quantitative in nature. There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis. The studies were limited based on year of publication. Only studies that were conducted since 1990 were used in order to have the most current and relevant research. Some of these studies were performed at all levels, but only the high school portion was used for the modified best-evidence synthesis. Every effort was put forth to find every dissertation, published research study, and every other report documenting student performance in regard to Science.

Literature Search Procedures

Both quantitative and qualitative research was reviewed for the study, though it was decided not include qualitative studies for this review due to the fact that Slavin's best-evidence synthesis did not include qualitative studies: (a) Education Full Text (H. W. Wilson), (b) Eric EBSCO, (c) Google Scholar, (d) ProQuest Dissertations and Theses Full Text, and (e) JSTOR. There was a total of 15,136 articles found when searching the

above databases. When searching in Google Scholar for the term, “Science Achievement,” a total 29,500 citations were available from across the years. Afterward, the search was modified to only include citations from the years 1990-2014. That narrowed the search to only include 16,900 citations. The terms “STAAR Biology,” “School Size,” “Economic Status,” “Expenditure,” “Mobility Rate,” “Non-White students,” “K-12,” and “Case Study” were added to produce 32,036 total citations as shown in Figure 1. After these citations, the repeated citations were removed. Citations from outside of the United States were removed as well as those that were qualitative in nature. Additionally, every attempt was made to acquire an all-inclusive group of the published studies that met the criteria outlined above. Please note that a specific limitation of this study is that the specific number of studies on student achievement related to school size and other specific variables are very limited; therefore, though best-evidence synthesis guidelines were used, more studies would have to be available to be included to be a valid best evidence synthesis. After all studies were filtered, 14 studies met the criterion that was set forth.

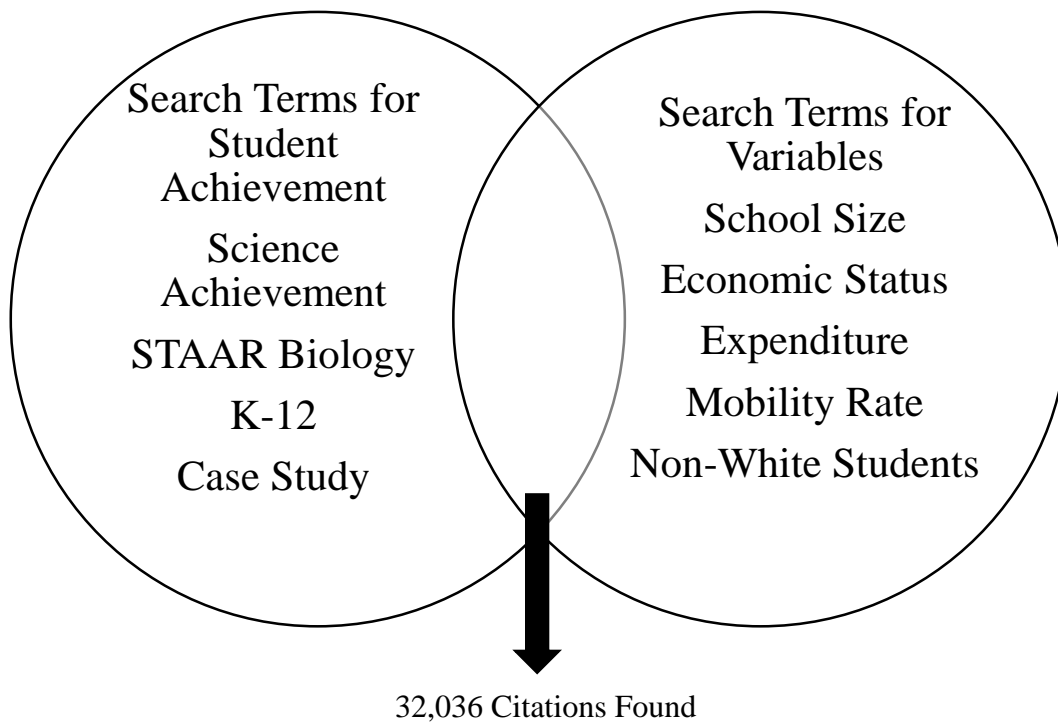


Figure 1. Citations found in the review.

The model presented in Table 1 shows the variables that were used in the modified best-evidence synthesis.

Table 1
Modified Best-Evidence Synthesis Model

9th Grade STAAR Science Achievement	School Size	Socio- Economic Status	Expenditure Per Student	Mobility Rate	Percentage of Non- Mainstream Students
	X	X	X	X	X
	X	X	X	X	X
		X	X	X	X
			X	X	X
				X	X

Factors Impacting Science Achievement

Information for the literature review was found in relation to school size, student socio-economic status, per-pupil expenditures, student mobility rate, and percentage of non-White students as those specific variables relate to or impact the performance of students on standardized tests. Each of those variables related to student achievement were analyzed via studies available in the literature.

School Size Related to Student Achievement

From the 26,036 studies found based on the search, there were 635 studies that related to school size and student achievement; however, only three published studies were found that met the requirements to be included in my study. The requirements for inclusion were: (a) all studies are directly related to student performance in American public schools grades 9-12 (b) every study that was used in the research was quantitative in nature. There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014. The screening process is shown in Figure 2 followed by the three studies that met the criteria.

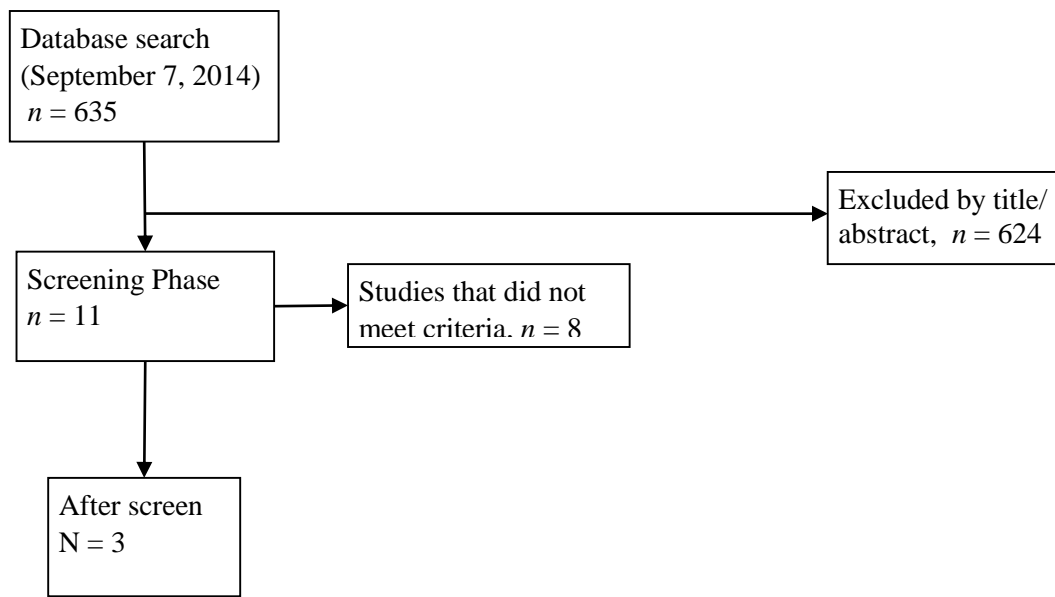


Figure 2. Screening of studies related to school size and achievement

New Jersey Study

Fowler and Walberg (1991) performed a study using data from the New Jersey Department of Education, Bureau of Information Services, and the Bureau of Testing for the 1984-1985 school year. During the 1984-1985 school year, school-level test results were only available for schools that had ninth grade students enrolled in their campus. There were 332 schools that included ninth graders, and test data were only available for 293 of those schools. The variables included in the Fowler and Walberg study were (a) percentage of students from low-income families/district socioeconomic status, (b) school size and number of schools in each district, (c) teacher characteristics, including salary, degree type, and years of experience, and (d) school outcomes. The researchers investigated the potential influence of 18 social, organizational, and financial variables on 23 learning and related outcomes. The researchers used Statistical Analysis

System (SAS) to run a series of regression equations (Fowler & Walberg, 1991). The computer first entered all possible independent variables and then dropped the variable least closely associated with the outcome, with the other variables held constant. The next least closely associated variable was then dropped, and this procedure continued until all remaining variables were significant at the standard .05 level of significance. This procedure allows the most consistent variables that are most closely associated with learning to be identified. Socioeconomic status of schools and of districts was allowed to compete with the organizational and financial variables in order to examine their relative contributions to learning, particularly in combination.

The results of this study revealed that seven of the variables were significantly associated with school size: (a) percentage of low-income students in a school, (b) size of school, (c) number of schools in the district, (d) percentage of teachers with a bachelor's degree, (e) pupil-teacher ratio, (f) average teacher salary, and (g) district socio-economic status (SES). The results indicated that the district socioeconomic status was the most consistent of the variables and was significantly and positively associated with 17 of the 18 outcomes. The researchers suggested that smaller school district and smaller schools are more successful in regard to student educational outcomes. One of the limitations that this study has in regard to the best evidence synthesis is that there is no mention of the effect size of the study. The researchers' results revealed that the larger the school size was, the lower the students' achievement test scores were.

North Carolina Study

McMillen, Zhang, Cobb, Williamson, Kaase, Williams, and Fiefs (2000) performed a study that analyzed test scores for Kindergarten through fifth grade schools, sixth to eighth grade schools, and ninth to twelfth grade schools in the state of North Carolina. For the purpose of my study, I examined the portion about the ninth to twelfth grade schools.

The researchers used North Carolina End of Course (EOC) test scores from the 1998-1999 school year in Algebra I, English I, U. S. History, Biology I, and Economic, Legal, and Political Systems. The researchers grouped the high schools for the study by membership. There were 292 secondary schools, grades 9-12, used for their study. The groups analyzed were: schools with less than 700 students, schools with 700-1000 students, schools with 1001-1500 students, and lastly, schools with more than 1500 students. The variables included in the study were percentage of students enrolled at the school who were non-White, the percentage of students who were eligible for free or reduced price lunch, and the percentage of students whose parents had no formal education beyond high school. The school size groups were compared by using the 1998-1999 standardized EOC test scores in all five subjects.

The researchers analyzed the data utilizing a correlation analysis. This article was developed for the State Board of Education in North Carolina and the researchers do not specifically report their methods for this study. This is a major limitation of the study. The results of the study indicate that there were no differences in test scores on any of the five tests based on school size. The achievement test scores were virtually the

same regardless of school size. There was a statistically significant interaction found between larger school size and lower student achievement. This connection was more prevalent in campuses where a larger percentage of students were eligible for free and reduced lunch. The researchers also stated that school size overlaps with many other variables that can impact student performance, so they claimed that it is very difficult to ascertain the true impact that school size has on student performance. The researchers felt that it is problematic to determine which variables are the ones that impact the relationship between school size and student performance (McMillen et al., 2000).

McMillen et al. found that there was a statistically significant relationship between student achievement and larger school size. The data that the researchers studied illustrated that the schools with the larger populations had lower student achievement.

Texas Study

Stewart (2009) conducted a study in which high school size in the state of Texas and student performance on the Texas Assessment of Knowledge and Skills (TAKS) were investigated. Stewart compared high school by sizes that are set by the University Interscholastic League (UIL). There are five categories, and they are as follows: 1A high schools have less than 195 students; 2A high schools have 195 to 414 students; 3A high schools have between 415 and 949 students; 4A high schools have between 950 and 1984, and 5A high schools have 1,985 students or more in their high school. Any high school not labeled a Disciplinary Alternative Education Program (DAEP), Alternative Education Program (AEP), Juvenile Justice Alternative Education Program (JJAEP), or

charter school was included in the study. This data are from the 2005-2006 school year. The researchers investigated the schools' performance on the TAKS test and determined what size of high school had the highest percentage of eleventh graders passing all four sections of the TAKS test. The four sections that the eleventh graders take are reading, writing, math, and science. The researchers conducted quantitative research by conducting a non-experimental, ex post facto design (Stewart, 2009). They used the Statistical Package for the Social Sciences (SPSS) program version 15.0 to perform the one-way ANOVA and the Scheffe analysis. They set the alpha level at .05 level of significance. The researchers used mean test scores of each school within each of the SES quartiles. The researchers conducted the study to determine if there was a relationship between student achievement in Texas (measured by Texas Assessment of Knowledge and Skills (TAKS) scores) and the size of the high school at different socioeconomic levels (Stewart, 2009). The researchers did not manipulate any of the data at any time.

Overall, the data from the study proved that students from the smaller schools are scoring statistically higher than the students at the larger schools. The results demonstrate that there are differences in student performance based on school size and the quartile that the students fall in. In the first quartile that includes less than 25% of economically disadvantaged students the 5A schools have a mean average of 81.71% passing while the 4A schools have a 77.22 % mean passing percentage. In the same quartile, 3A schools have a mean passing percentage of 78.81, 2A school have a mean passing percentage of 78.70, and the 1A schools have a mean passing percentage of

72.50. In this quartile overall the 5A schools perform statistically better than all of the other classifications with there being an almost 10 percentage point difference between 5A and 1A. In the other three quartiles, the opposite holds true. The 1A and 2A schools perform statistically better than the 5A schools when comparing mean test scores. This exposes that eleventh grade students in the smaller schools performed better on the TAKS test during the 2005-2006 school year. The researchers demonstrated that schools that are smaller have a statistically higher percentage of students passing all four sections of the TAKS test during the 2005-2006 school year.

School Size Related to Student Achievement Studies Summary

It is important to note that in all the three articles that were found that were related to school size and student achievement, all three displayed that students that attend smaller school perform better in school. These articles had different types of methodologies that included quantitative and mixed-methods research. None of the three articles listed effect sizes. Student socio-economic status was a variable that was discussed as one that impacted student performance as well as school size in these studies.

Socio-economic Status Related to Student Achievement

There were 26,036 studies found based on the search, there were 1,714 studies that related to socio-economic status and student achievement. Only one study met the requirements to be included in my study. The requirements for inclusion were: (a) all studies are directly related to student performance in American public schools grades 9-12 (b) Every study that was used for the research was quantitative in nature. There were

some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014.

The screening phase is shown in Figure 3. The one study is reported as follows.

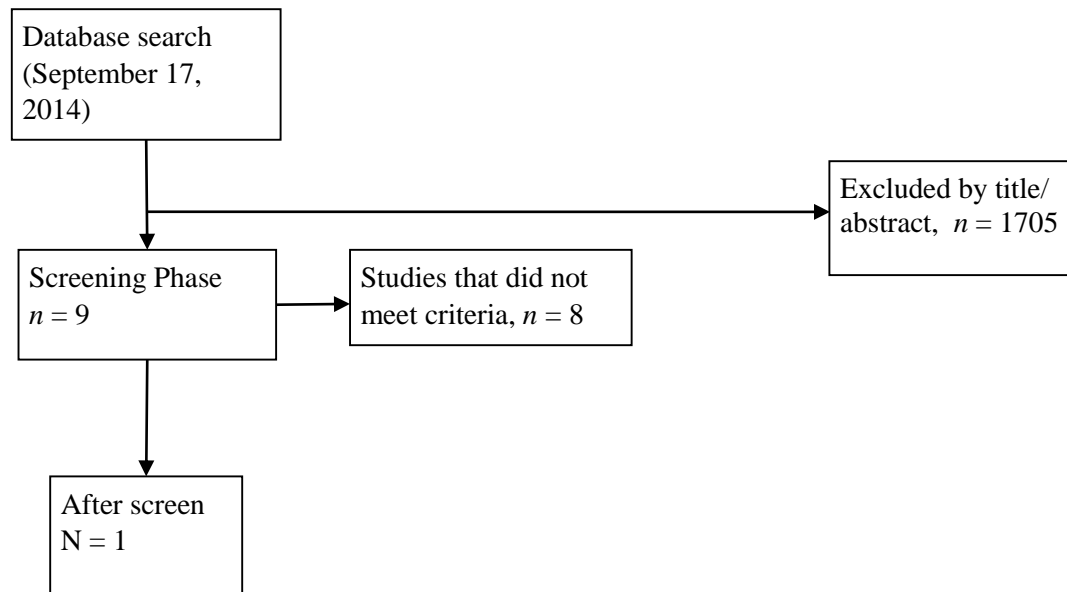


Figure 3. Screening of studies related to socioeconomics and achievement.

Louisiana Study

Caldas and Bankston (1997) conducted a study in Louisiana that investigated the relationship between socioeconomic status and individual student achievement. The researchers used the mathematics, English language arts, and written composition components of the Louisiana Graduation Exit Examination (GEE) to measure student achievement.

The tests used for this study are the ones that were given to tenth graders in 1990. They used test score data from 42,041 students in the State of Louisiana. The researchers

performed a principal-component analysis on the raw mathematics, language arts, and written composition scores and they used the output of the weighted factor as the dependent variable of student achievement, school-level measures of SES, individual-level control variables, and school-level control variable.

The researchers conducted a “series of OLS regressions in four steps to show the effect of adding school-level variables into the model while reporting standardized regression coefficients to indicate the relative effect of each variable on school achievement” (Caldas & Bankston, 1997, p. 272). Academic achievement was regressed against all of the individual-levels in the first step. On the second step, the school-level poverty status was added to the model. On the third step, the school-level family social status variable was added. On the last step, the researchers included the school-level variable for the racial composition.

The results from the study show that the highest correlation between individual-level and school-level variables was between minority race and percentage of minority students in the schools ($r = .606$). In the portion of the study in which only individual-level variables were included, the poverty status of individual students had a statistically significant negative effect on academic achievement ($\beta = -.069$). Minority race had an even higher effect on student achievement ($\beta = -.314$). Another variable that had an effect on student achievement was family social status ($\beta = .171$). There were other variables that the researchers used in the study, but these are the ones that directly related to this modified best-evidence synthesis so I did not include other results.

Socio-economic Status Related to Student Achievement Study Summary

There were many articles that related to socio-economic status and student achievement that I found. Only one of them met the criteria of my modified best-evidence synthesis. Most of the articles related to K-12 education, not just high schools as is the case in my study.

Per Pupil Expenditure Related to Student Achievement

Among the 26,036 original studies that were discovered in the initial search, only two published studies were found that related to per pupil expenditure and student achievement. These four studies met the requirements to be included in my study. The requirements for inclusion were: (a) all studies are directly related to student performance in American public schools grades 9-12 (b). There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014. The screening phase is shown in Figure 4. The two studies are reported as follows.

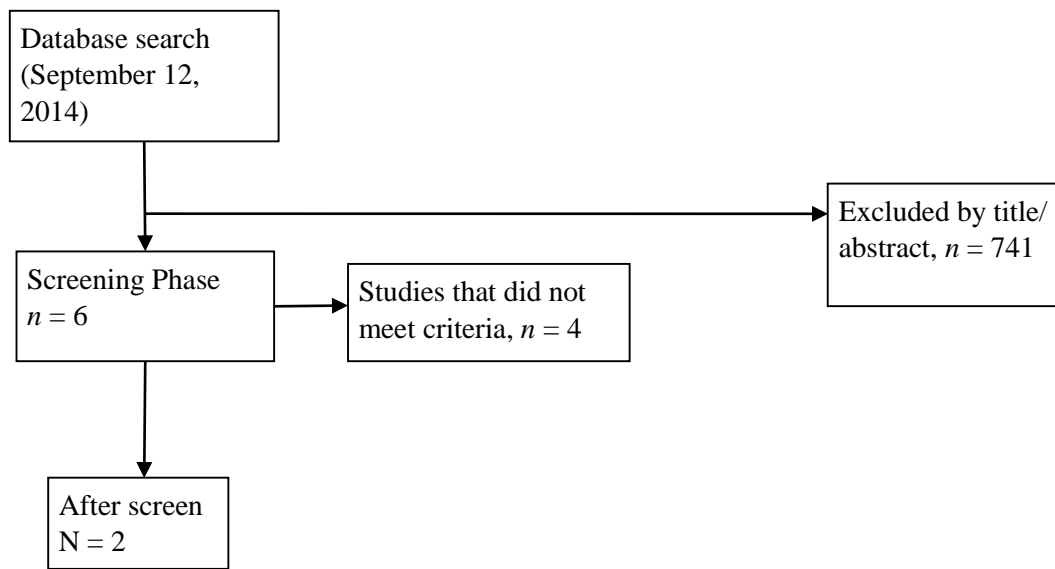


Figure 4. Screening of studies related to per pupil expenditures and achievement.

Ohio Study

De Luca and Hinshaw (2013) conducted a study to investigate the role of school district expenditures in predicting student achievement in Ohio. They used data from the 2009-2010 school year and used data from 607 of Ohio's 613 school districts. The variables included in this study are: school district operating expenditures on administration, building operations, instruction, pupil support, and staff support for each of the three academic levels (highest, continuous improvement, and lowest). In the state of Ohio, there are six levels of performance on their standardized tests. They are: advanced, accelerated, proficient, basic, limited, and untested. Students are tested yearly in grades three through eight on reading and math. Fifth and eighth graders are tested in science and tenth graders take the tenth grade graduation assessment. Once the scores are available for the students the school districts are given a score based on their

students' performance on the exams. The designations that are given to the school districts are excellent with distinction, excellent, effective, continuous improvement, academic watch, and academic emergency. The independent variables in this study were the percent of total district expenditure for administration, building operations, instruction, pupil support, and staff support. The dependent variable was the performance index score.

The results of this study disclosed that most of the schools spent well below the recommended 65% of their operating budget on instruction. The results of this study indicated that the schools that were the most successful on the performance index were spending their money on pupil support. The results of one of the regression analyses confirmed that only one variable was positive and statistically significant—that of pupil support ($p = .027$); other variables (staff support, building operation, and administration) were tested. The most successful group from the study spent only 56% of their operating budget on instruction. The researchers also found that the income level of district residents may impact student achievement more than the amount of money spent on instruction.

Texas Study

Jones and Slate (2010) conducted a study that investigated to what extent do Texas public schools compliance with the 65% instructional expenditures ratio was related to performance on the TAKS test. The researchers utilized data from TEA for the 2007-2008 school year for this study. There were 943 school districts in the state of Texas that were used for this study. These districts had passing rates on the five TAKS

academic measures. 363 school districts provided data for African American students, while 653 school districts provided data for Hispanic students. Texas reports data in a manner that if there are a small number of students the scores are not reported. The researchers used instructional expenditure ratio as the dependent variable for this study. TEA defines instructional expenditure ratio as the money that is spent directly on instructional activities.

The researchers grouped all of the schools into three groups: schools that spent below 60% on instructional expenditures, schools that spent between 60% and 64.99% on instructional expenditures, and lastly schools that spent over 65% on instructional expenditures. They also performed a multivariate analysis of variance (MANOVA) as well as Scheffe post hoc procedures for the subgroups of all students, i.e., African-American students, Hispanic students, and White students. The researchers did the same analysis for all of the students as well as each subgroup. The results of the MANOVA for all students were $F = 9.95, p < .001, \eta^2 = .024$. The effect sizes for all students are as follows: Math = .04, English = .024, Science = .037, Social Studies = .028, and Writing = .02. The next group that the researchers explored was the African American students. The MANOVA for this group revealed a statistically significant result of $F = 8.88, p < .001, \eta^2 = .06$. The effect sizes for the African American student are as follows: Math = .065, English = .05, Science = .08, Social Studies = .043, and Writing = .038. In regard to Hispanic students in this study, the MANOVA showed that there was a statistically significant result, $F = 9.96, p = .001, \eta^2 = .02$. In regard to the effect sizes for these students, the effect sizes are as follows: Math = .026, English = .014, Science = .017,

Social Studies= .01, and Writing= .026. The last group that Jones and Slate (2010) investigated was the White students. The MANOVA presented a result of $\Lambda = .92$, $p = .001$, $\eta^2 = .04$ for the White students. Effect sizes in the form of η^2 for all students are as follows: Math = .04, English= .03, Science = .06, Social Studies = .05, and Writing= .023.

The overall results from this study expose that there was a strong relationship between 60% instructional expenditures and student test performance. This study demonstrates that there is a clear relationship between instructional expenditure and subgroup student performance (Jones and Slate, 2010). When the researchers conducted the Scheffe post hoc procedures they found that school districts spending below the 60% threshold their students performed significantly lower than did the other two districts that spent more money than this group. The researchers stated that these data are from one year, one state, and should not make broad generalizations because of the results. This study is the first that I found that met the requirements for the best-evidence synthesis.

Per Pupil Expenditure Related to Student Achievement Studies Summary

There were three studies found that included expenditures related to student performance that met the requirements of my search criteria. Two of the researchers focused on the district level spending in schools while one looked at per-pupil expenditure. The two articles included district-level spending demonstrated that the schools that are more successful spend less than the districts that are not as successful.

The article that was about per-pupil expenditure showed that spending more per student improves performance on standardized tests.

Mobility Rate Related to Student Achievement

There were 26,036 studies found based on the search, there were 53 studies that related to mobility rate and student achievement. Only one studies met the requirements to be included in my study. The requirements for inclusion were (a) all studies are directly related to student performance in American public schools grades 9-12 (b). There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014. The screening phase is shown in Figure 5. The two studies are reported as follows.

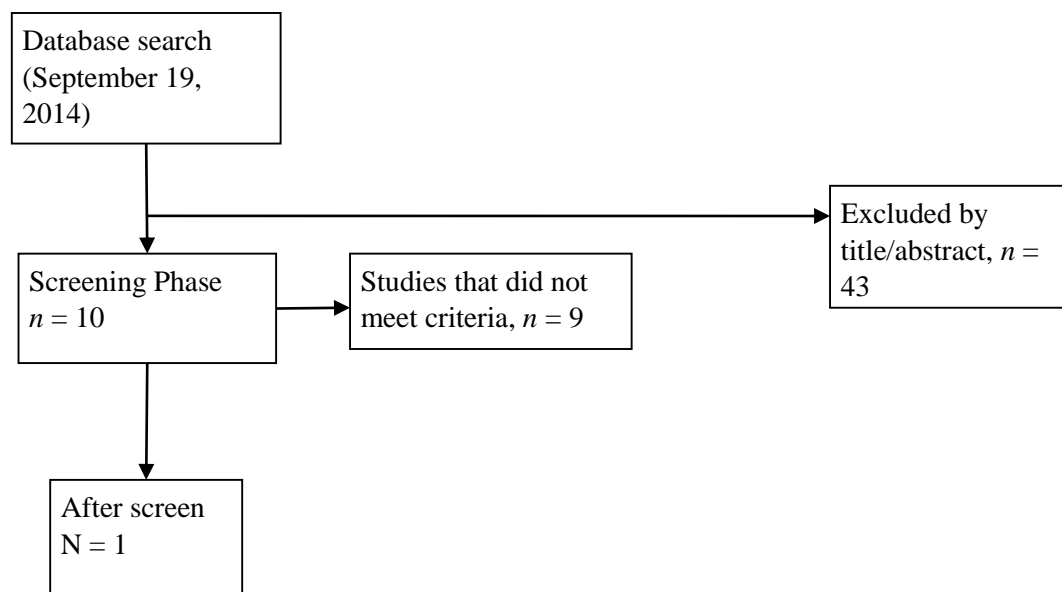


Figure 5. Screening of studies related to mobility rate and achievement.

Louisiana Study

Engec (2006) conducted a study in Louisiana that used data from the 1997-1998 and 1998-1999 school years in public schools grades K-12. The researcher used the data from the 1997-1998 school year to determine mobility rates. The researcher did not use the kindergarten students because there was not test data available. The researcher used the Iowa Test of Basic Skills (ITBS) test data for the 1998-1999 school year to determine student test performance. Another relationship that was investigated was the relationship between mobility rate and suspension rates.

In this study, the grades examined were 3, 5, 6, 7, and 9. The researcher used data from the 1997-1998 school year to investigate suspension rates. The researcher used one-way ANOVAs and ANCOVA to establish the relationships that existed between the variables. The researcher indicated that there is a negative association between ITBS test scores and the number of moves a student makes. In the third grade, students that stay in the same school all year have an average score on the ITBS of 76.05 ($ES = .45$) while the students that move once have a score of 54.46 ($ES = .11$). Students that move two or more times in a school year score on an average of 47.67. In the fifth grade, the results explain that zero moves a student scores an average of 72.07 ($ES = .43$). Students that move one time score an average of 52.68 ($ES = .12$) and the students that move two or more times score 45.14. In the sixth grade, students that stay in the same school all year score an average of 75.76 ($ES = .50$). The students that move once score 51.72 ($ES = .12$) while the students who move two or more times score 44.22. The last group discussed is the seventh grade group. Students in the seventh grade that stay in the same

school year round score an average of 74.27 ($ES = .39$). The students that move once during the school year score an average of 50.71 ($ES = .02$). The students that move two or more times during the year score an average of 49.51. There is up to a 20 point difference with some of the grade levels when you look at zero moves to two or more moves during a school year. There were limitations in this study, because the researcher stated that he could not know what caused the frequent moves of the students and that the reasons of the moves could play a role in the negative relationship as well.

Mobility Rate Related to Student Achievement Studies Summary

There was one article that related to mobility rate and student achievement that met my requirements for inclusion in this modified best-evidence synthesis. It was a quantitative study and used data for large groups of students as well. Some of the articles reported effect sizes. This study showed that moving more often is linked with lower academic achievement by students.

Non-White Students Related to Student Achievement

It was found that 26,036 studies found based on my initial search, there were 105 studies that related to the percentage of non-White students and student achievement. Only two published studies found that met the requirements to be included in my study. The requirements for inclusion were (a) all studies are directly related to student performance in American public schools grades 9-12 (b). There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014. The screening phase is shown in Figure 6. Both of those studies are shared as follows.

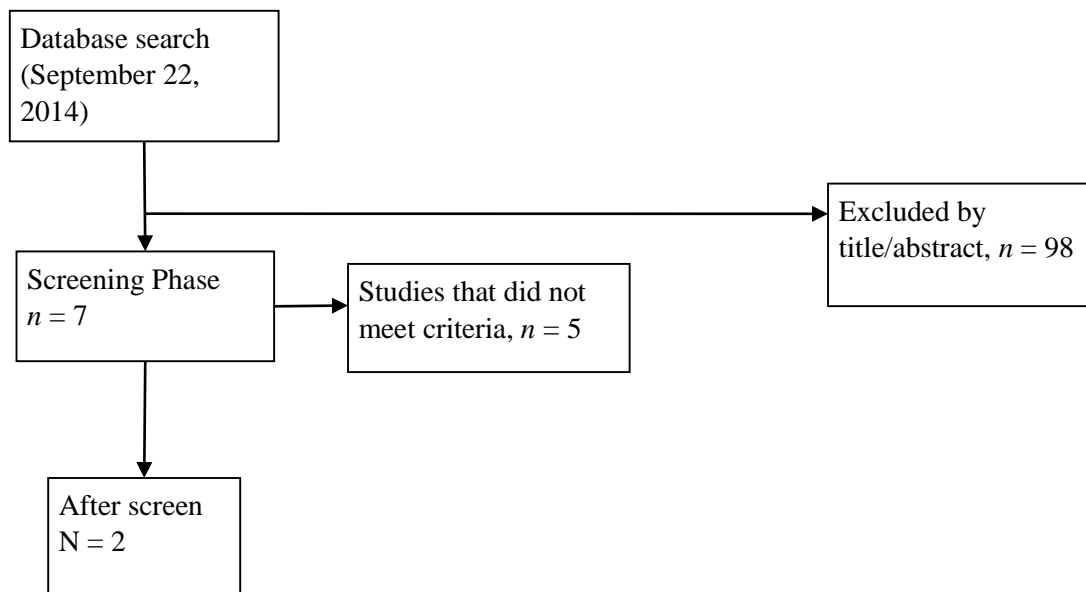


Figure 6. Screening of studies related to Non-White students and achievement.

Massachusetts Study

Sanchez, Ehrlich, Midouhas, O'Dwyer, and Regional Educational Laboratory Northeast and Islands (ED) (2009) performed a study in Massachusetts to examine the performance of tenth grade Hispanic students on the Massachusetts Comprehensive Assessment System (MCAS) tests in English Language Arts and Math. The researchers took data from the 2002-2003 school year to the 2005-2006 school year. They conducted the research because of the achievement gap that existed between the Hispanic students and the other subgroups of students in the state of Massachusetts. The researchers performed multilevel regressions for this research study. There were many variables that were used for the study. Some of these variables include gender, from a low-income

household, special education, limited English proficient, former limited English proficient, first languages other than English, and immigrant from other countries.

Overall, the results of this study show that students that are Hispanic scored lower on the MCAS ELA test than students who were non-Hispanic. The t -test scores demonstrate this with the Hispanic students having an overall $t(df) = 20.09, p = .00013309$ and the non-Hispanic student having a $t(df) = 24.43, p = .0000121863$. The results of this study show that students that are Hispanic scored lower on the MCAS Math test than students who were non-Hispanic. The t -test scores demonstrate this with the Hispanic students having an overall $t(df) = 31.72, p = .000013309$ and the non-Hispanic student having a $t(df) = 90.75, p = .0000121863$. The results of this study explain that the students that were part of the Hispanic population scored significantly lower than non-Hispanic students each year of the study.

In regard to the MCAS English Language Arts test, students that were from a low-income household scored lower than students that were not. Another result of the study is that the scores of the Hispanic students increased over the course of the study by a significant amount. Female Hispanic students outscored their male counterparts by a significant amount on the English Language Arts portion of the assessment while the Male Hispanic students scored significantly higher on the Math portion than the female students. Hispanic students in the study who were from low-income homes, special education, or limited English proficient or formerly limited English proficient in the previous two years performed significantly lower on the Math and English language arts portions of the assessment. The students that went to school on campuses with higher

attendance rates scored significantly higher on the English language arts and Math parts of the test than student that went to school on campuses with lower attendance rates.

The study had several limitations including the fact that the study described statistical associations, not causal relationships between the variables of the study. Another limitation of the study is that there was a portion of the data that was excluded from the study appeared to include students performed lower on the test. This could have impacted the study by giving bias to the study. There were many variables that could possibly explain the differences in the performance on the exam that were not analyzed in this study. Another limitation that was discussed is the fact that the federal testing policy was changed in February of 2004 and this was not accounted for in the study. Effect sizes were not discussed in this article.

St. Louis Study

Trent (1997) conducted a study that used data from the St. Louis Public School district to determine if Black students are performing lower than white students. The researcher used data from the 1994-1995 data file for the first part of the study. The second portion of the study was based on a national survey that focused on the effects of race on education, employment, and attitudes. The researcher used the Stanford Achievement Test (SAT) as the measure of achievement for the purpose of this study. Math and reading are the two portions of the test that were used for this study.

The researcher used the data to determine if the Black and White students' scores were different because of differences in students' backgrounds. Variables used in this study were age, sex, socioeconomic status (SES), prior test scores, and school

characteristics. Some of the school characteristics used include school size and poverty concentration.

The researcher used regression analysis to determine the differences in achievement scores between Black and White students. He did this at the state and national level. The overall findings of this study illustrate that poverty is a significant predictor on the SAT reading exam with β being -.832 for the entire sample of students in regard to Reading performance. In regard to Math performance, β is -1.007, and this shows that poverty concentration is a significant predictor on student performance. The findings from this study include the fact that students that live in neighborhoods with higher poverty concentration score lower than students that live in neighborhoods with a lower poverty concentration. The findings also confirmed that Black students are more likely to attend schools with a higher concentration of poverty. Another thing that the researcher found is that students that go to schools with a higher population of poverty the worse they perform.

Percentage of Non-White Students Related to Student Achievement Studies

Summary

There were only two articles that were found that related to the percentage of non-White students and student achievement. Both of the articles establish that students that were non-White performed worse in school. Also, they revealed that schools that had more students that were non-White performed worse.

Multiple Variables Related to Student Achievement

There were 26,036 total studies found based on the search. However, there were 26 studies that related to multiple variables and student achievement and only four published studies found that met the requirements to be included in my study. The requirements for inclusion were: (a) all studies are directly related to student performance in American public schools grades 9-12 (b) every study was quantitative in nature that I used for my research. There were some studies that were mixed-method, but only the quantitative data were included in the modified best-evidence synthesis and (c) each study was from the years 1990-2014. The screening phase is shown in Figure 7. All four of those studies are shared as follows.

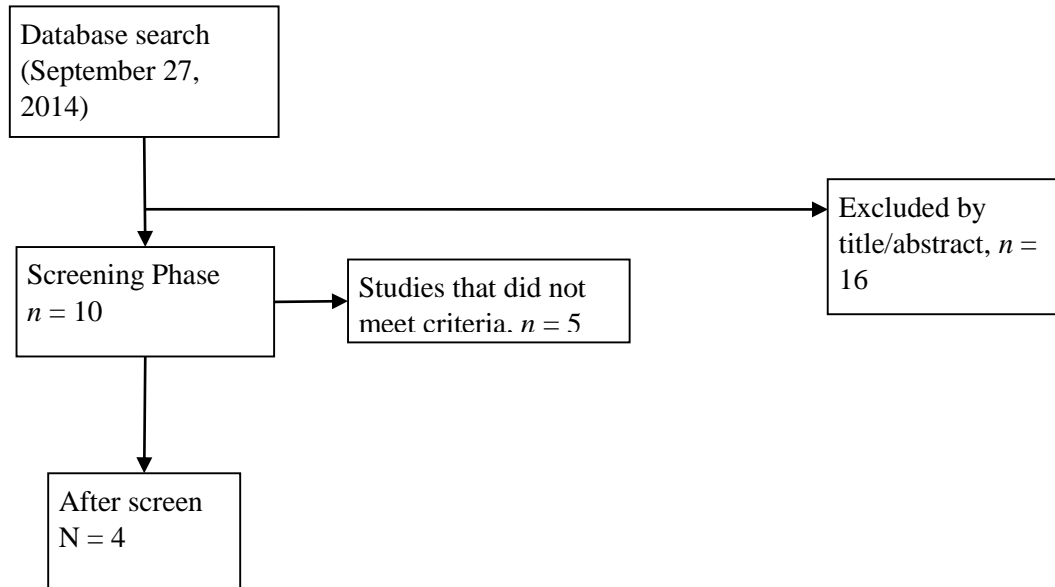


Figure 7. Screening of studies related to multiple variables and achievement.

Louisiana Study

Bankston and Caldas (1998) investigated the influence of schoolmate family structure, racial concentration, and socioeconomic status on the academic achievement of individual African American and White students in Louisiana. The researchers pulled their data from the test results of 18,000 tenth graders who took the Louisiana Graduation Exit Examination. They also only used students who were either White or African American. They excluded students who were in special education. There were a total of 42,041 students that could be used in this study and the researchers used random sampling to limit the sample to 18,310 students. The researchers wanted to determine academic achievement for this study so they used raw scores on the math, language arts, and written composition to do this. The researchers had the following variables as part of the study: Female-headed family structure, race, parents' educational level, family poverty status, and characteristics of schoolmates. Female-headed family structure was determined based on a family that was a single-parent, female-headed household and by coding them as 1 while coding all other families as 0. Race was determined by coding African American students as "1" and White students were coded a "0." Students were coded as 0 if they were not participants in the free or reduced lunch program and as 1 if they were participants.

The researchers used SAS Proc Mixed to multilevel unconditional means and random coefficient models. They had multilevel models that they referred to as "random coefficient regression models," "random-effect models," or "multilevel linear models" (Bankston & Caldas, 718, 1998). The results of the study show that 71% of the African

American students performed below the median on the study's measure while only 34% of White students performed below the same level. Also, findings reveal that there are strong negative correlations between academic achievement and the African American race with a score of ($r = -.363$), percentage of African American race in school with a score of ($r = -.303$), female-headed family with a score of ($r = -.373$), and percentage of female-headed families in schools with a score of ($r = -.352$). The largest correlation in the study is between the percentage of African Americans in school and percentage of students from female-headed families in school with a score of ($r = .797$). The study results reveal that minority race has the strongest negative correlation with test performance. The level of the parents' education is positively associated with test performance. The order of correlation is minority race, followed by parental education, poverty status, and then single-parent family structure.

Missouri Study

Vorthmann (2011) performed a study that examined the relationship between school size and student achievement in Missouri. The researcher investigated elementary, middle, and high schools to determine the optimal school size to maximize student achievement on the Missouri Assessment Program (MAP) grade level assessments as well as EOC assessments for the 2009-2010 school year. The researcher used a causal-comparative quantitative research design. School size was the independent variable was established by using the data from the Missouri Department of Elementary and Secondary Education (DESE). The researcher divided the school sizes into groups and used the following labels for the high schools: Very Small (35-153 students), Small

(154-265 students), Medium (266-558 students), Large (559-1040 students), and Very Large (1041-2421 students). The researcher used the following independent variables location, ethnicity, poverty, and special education classifications. Included in the study were all 2,334 public schools in Missouri excluding charter, alternative, special education, career, vocational, and technical schools. From this, 492 of the schools were high schools. The EOCs that were included in the study are Algebra I, English II, Biology, and Government. There are four score ranges and achievement levels for these EOC assessments. They are as follows Below Basic (100-176), Basic (177-199), Proficient (200-224), and Advanced (225-250).

The researcher conducted the research by “using a one factor analysis of variance (ANOVA) to determine if statistically significant differences in student achievement existed as measured by the MAP Grade-Level Assessments in communication arts and mathematics and MAP EOC Assessments in English II, Algebra I, biology, and government among schools of different sizes. Statistical significance for the ANOVA was set at $\alpha = .05$. A follow-up post hoc analysis, the Tukey Honestly Significant Difference (HSD), was used to determine which interaction effect means were statistically significantly different with $\alpha = .05$. A single hypothesis was tested to address each research question for RQ 1 through RQ 8” (Vorthmann, 2011). The researcher also conducted an ANOVA for each of the other variables as well.

In regard to the findings, there were mixed findings, but there was higher student achievement in English II, biology, and government in very large high schools. Algebra I was the exception where the higher achievement was seen in small high schools. The

interaction effect of school location, ethnicity, poverty, and special education classification on elementary, middle, and high school size was also examined by the researcher. The researcher found that large city high schools had the lowest levels of student achievement in English II and biology. High minority schools produced a higher level of student achievement in English II and biology. In High ethnicity high schools, medium and very large high minority high schools produced higher levels of student achievement in English II and biology when compared to large high minority high schools. The study revealed that lower levels of student achievement in high poverty schools rang true in all four areas tested on the EOCs. Among the high poverty schools, the very small, small, and medium high poverty high schools had higher scores on Algebra I and Biology compared to the big school schools. In regard to English II, the small and medium poverty schools produced higher levels of student achievement than the large and very large schools. Biology compared to large and very large high poverty high schools, while small and medium high poverty schools produced higher levels of student achievement in English II compared to large and very large high poverty schools. The very small and medium poverty high schools produced higher levels of student achievement on the government EOC. The last variable discussed was special education and its relationship to student achievement. Schools that were high special education school produced the lowest levels of student achievement in all areas tested. All of these interactions show that different variables impact student performance and the combination of some account for student performance changes. This research study

covered elementary schools, middle schools, as well as high schools and the only portion that I included was the portion about high schools.

South Carolina Study

Durbin (2001) carried out a study to determine the relationship between the size of high schools, per pupil expenditure, and student achievement while controlling for the effects of socioeconomic status (SES). The study used all eleventh graders in 192 South Carolina public high schools that took the Metropolitan Achievement Test-Seventh Edition (MAT-7) in the spring of 1998. The subjects used for this study were reading, written language, and mathematics. The researcher used the mean total scores for all three subjects as the measure of student achievement.

School size was defined by the total number of students tested in the spring 1998 administration of the MAT-7. Socioeconomic status was measured by the percent of eleventh grade students identified in the “Total Number Tested” that received free lunch in the school-lunch program during the 1997-1998 school year. In another portion of the study, school size was defined as the daily average membership in the school. The last variable that was used in the study is per pupil expenditure. It was defined as the 1997-98 fiscal year operational cost per pupil for each of South Carolina’s public high schools with an eleventh grade (Durbin, 2001).

The schools were grouped into quartiles and the 192 schools were broken down into the following groups: very small schools 17-99 eleventh graders tested, small schools 101-174 eleventh graders tested, medium schools 175-251 eleventh graders tested, and large schools 254-629 eleventh graders tested. The researcher broke the

schools into groups based on SES and established the following groups: low SES group 53%-85% free lunch eleventh graders tested, medium SES group 28%-52% free lunch eleventh graders tested, and the high SES group 3%-27% free lunch eleventh graders tested.

The researcher used multiple regression to determine the relationships between all of the variables included in the study. The researcher also set $\alpha = .05$. The data sets were collected from the South Carolina State Department of Education. The relationship between school size and achievement was examined while controlling for socioeconomic status using a multiple regression process, a review of descriptive statistics, and a post hoc multiple comparisons technique. These data were used to identify school sizes that yielded academic success for students while maintaining cost effectiveness

The results of the study start with the relationship between school size and mean total reading scores while controlling for SES. Both school size and SES were predictors on the mean total reading standard scores. The partial correlation between school size and mean total reading score was $p = .201$ with a significance of .005. The next portion of the study involved mean total mathematics scores while controlling for SES. The relationship between school size and mean total mathematics standard scores when controlling for SES, was statistically significant, with $p = .012$ and a partial correlation of .182. The third portion of the study examined the relationship between school size and mean total written language standard scores while controlling for SES. Both school size and SES were found to have a statistically significant relationship to the mean total

written language scores. The relationship between school size and the mean total written language standard scores, when controlling for SES, was statistically significant with $p = .010$ and a partial correlation of .185.

Overall, as school size increased, scores in reading, mathematics, and written language increased significantly, even after controlling across size groupings for SES. There were other portions of the results that did not directly pertain to the modified best-evidence synthesis so they were not included. This study was part of a dissertation.

West Virginia Study

Howley (1996) conducted a study in West Virginia that investigated the relationship between school size and student performance. This study was based on the researcher's dissertation. Both school size and district size were used as units of analysis in the study. West Virginia schools that include third grade, sixth grade, ninth grade, or eleventh grade were included as well as all West Virginia school districts. The variable of size was defined as the number of students in each grade level grouped by school or school district. SES was defined by the rate of students receiving free or reduced lunches. Student achievement was measured by the Comprehensive Test of Basic Skills (CTBS). This test is administered to all students in West Virginia that are not in special education classes. The data for this study is from the 1990 school year. The researcher used regression analysis to determine the relationship between school size and achievement.

The researcher found that the regression pointed out that there was not a statistically significant correlation between seven of eight analyses. The only correlation

that was statistically significant existed in the third grade analysis ($r = .11$). This article was basic in the explanation of the results and was missing some tables that demonstrated the results. The overall findings of this study showed that the relationship between school size and student performance changed based on different variables. SES impacted student performance in some cases and school size impacted it other cases. In some situations, both of these variables impacted student performance.

Multiple Variables Related to Student Achievement Studies Summary

The three articles that were found that discussed multiple variables were all over the place in regard to organization as well as outcome. They were all on different topics but all pertained to student achievement at the core.

Summary

All of the articles that were used in the modified best-evidence synthesis depicted that there are many variables that impact student performance. The variables that were researched were school size, student socio-economic status, per-pupil expenditures, student mobility rate, and percentage of non-white students as those specific variables relate to or impact the performance of students on standardized tests. The results from my research exposed that all of these variables impact student performance at different levels. From the research, a proposed model was developed that demonstrates the impact that each variable will have on student secondary science achievement as measured by passing the STAAR Biology exam during the 2012-2013 school year. This model is shown below in Figure 8. The model suggests that there is a link between non-white students and mobility rate, as well as SES and per pupil expenditures. It should be

considered that there would be a predicted path between SES and non-White students and then there would be a predicted path between SES and school size. In essence, then all of those in some way would predict secondary school science achievement.

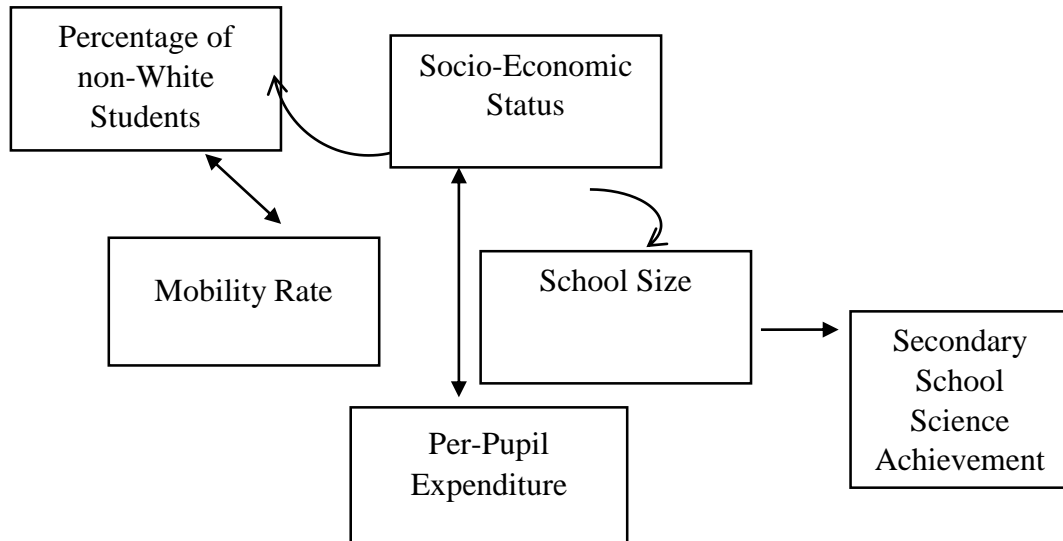


Figure 8. Proposed model of the relationship of secondary school science achievement and school size considering the variables of percentage of non-White students, mobility rates, per pupil expenditure, and socio-economic status based on published research.

CHAPTER III
STUDENT ACHIEVEMENT ON THE STAAR BIOLOGY EXAM RELATED TO
SCHOOL SIZE, STUDENT SOCIO-ECONOMIC STATUS, PER PUPIL
EXPENDITURES, STUDENT MOBILITY RATE, AND PERCENTAGE OF
NON-WHITE STUDENTS: A PATH ANALYSIS STUDY

Introduction

Students in today's schools are being asked to digest material that is more rigorous and widespread in regard to content. As a result, the depth of Science instruction has gained traction in the American public schools in recent years (107th Congress of the United States of America, 2001; American Association for the Advancement of Science, 1989, 1993, 2013; Jackson & Ash, 2012). This coupled with the State of Texas' requirements to graduate high school brought to light that there are many factors that are impacting student performance on the State of Texas Assessments of Academic Readiness (STAAR). Some of these factors are naturally occurring and cannot be controlled while some of these can be controlled by school officials and policy makers. As a result of House Bill 5, in Texas, the Biology exam is one of the five STAAR exams that a student must pass in order to graduate high school (Texas Education Agency, 2013b).

Purpose of the Study

The purpose of this study was to determine if there is a relationship between student achievement on the STAAR Biology exam and school size, student socio-economic status, per pupil expenditures, student mobility rate, and percentage of non-

White students. Based on a modified best-evidence synthesis and critique of the literature, a model path was proposed as indicated in Figure 9. The model, as indicated, is based on prior literature. It should be considered that there is a link between non-white and mobility rate, as well as SES and per pupil expenditures. It should also be considered that there would be a predicted path between SES and non-White students and then there would be a predicted path between SES and school size. In essence, then all of those in some way would predict secondary school science achievement.

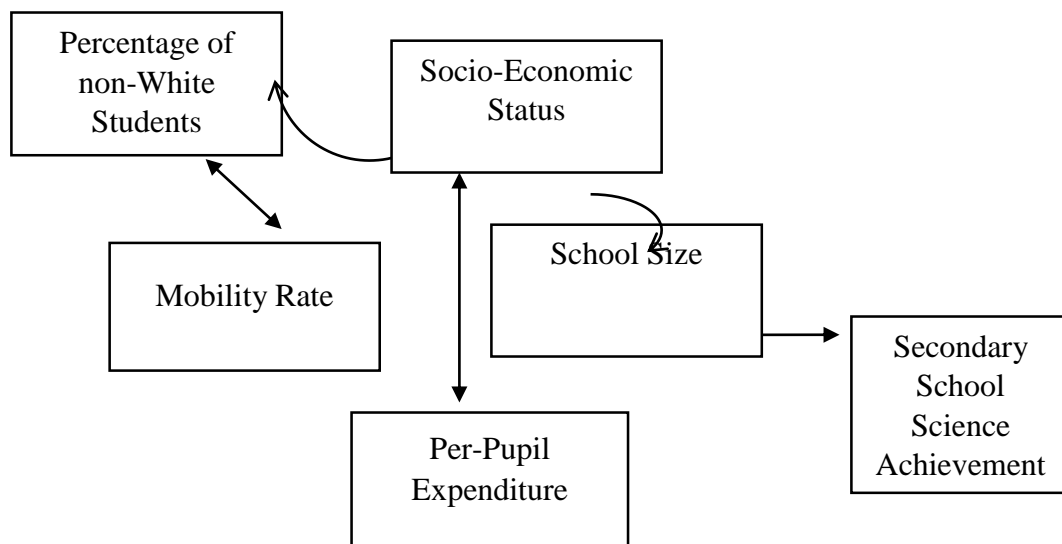


Figure 9. Proposed path model.

Research Questions

1. What relationship, if any, exists between school size and student achievement on the STAAR Biology?

2. What relationship, if any, exists between student socio-economic status and student achievement on the STAAR Biology?
3. What relationship, if any, exists between per pupil expenditures and student achievement on the STAAR Biology?
4. What relationship, if any, exists between student mobility rate and student achievement on the STAAR Biology?
5. What relationship, if any, exists between percentage of non-White students and student achievement on the STAAR Biology?
6. What relationship, if any, exists between school size, student socio-economic status, per pupil expenditures, student mobility rate, and percentage of non-White students?

Limitations

This path analysis was conducted using data from Texas public high schools that report STAAR passing rates in Biology. High schools that have a grade span of 9-12 and are not alternative, private, or charter schools were included. Data will be examined for one academic year, the 2012-2013 school year. Biology is the only subject being examined in this study, as a result, other factors will not be investigated in this study and this limits the transferability of the results. A limitation of this study is that the data will include transfer students as well as students that had been at the school for their entire ninth grade year.

Method

Data Collection Procedures

All data were collected from the Texas Education Agency (TEA). The data were pulled from the Public Education Information Management System (PEIMS). PEIMS encompasses all data requested and received by TEA about public education, including student demographic and academic performance, personnel, financial, and organizational information (Texas Education Agency, 2014). The data used in this study is school level data, not individual level data. I downloaded all of the data for every school in the state of Texas there was data for 8,555 schools. This data were from the 2012-2013 school year. The scores for the 2011-2012 school year were not available because it was the first year that the STAAR tests were administered. As a result, these were the only data available at the time of the study. Data as downloaded for the STAAR EOC tests as well as data for each campus. The data from the 2011-2012 school year was subsequently downloaded because the financial data was reported in a different manner in the 2012-2103 school year.

Microsoft EXCEL 2013 was used to organize the data. Once all data was gathered, e every variable was labeled using the data dictionaries that TEA provides. In order to establish percentage of non-white students, a formula had to be developed to take the percent of white students subtracted from 100% to establish the campus percentage of non-white students. The final variables that were used for this study are STAAR Percent at Phase-in Level II or Above End of Course Biology STAAR Achievement (Percent passing Biology STAAR exam), Total students (School Size),

Percent of economically disadvantaged students, 2011-2012 Expenditure-Instruction-Per-Student (2011-2012 Expenditure per-student), 2011-2012 Mobility Rate, and Percentage of Non-White students.

After labeling all variables, they were then sorted all 8,555 campuses by type and moved all campuses that have a grade span of 9-12, are not alternative schools, are not private schools, or are not charter schools onto the main database page and ended up with 1,048 high schools that were used for the study. These schools were chosen because they are traditional 9-12 schools that include all students. After all of the data was sorted, only 1,029 schools were used because 19 schools had missing data that would cause them to not be valid in the path analysis.

Measures

The variables in this study were collected yearly by the Texas Education Agency (TEA). The definitions described below are directly from the 2011-2012 AEIS Academic Excellence Indicator System (AEIS) Glossary (Texas Education Agency, 2012a). The variables that were included in this study are student achievement on the STAAR Biology exam, school size, student socio-economic status, per pupil expenditures, student mobility rate, and percentage of non-White students.

Variables

Percentage of non-White students: The percentage of non-White students for each campus was determined by taking the percentage of White students per campus and subtracting that percentage from 100 percent (Texas Education Agency, 2012a). This was done by using Microsoft EXCEL and developing a formula.

Per pupil expenditure: TEA reports the amount of money spent on each student each year. The data for this study was used from the 2011-2012 school year data, not the 2012-2013 school year data because TEA began using a different reporting process. For the purpose of this study, this variable is represented by a dollar amount that comes directly from TEA.

School size: School size was the student enrollment on October 28, 2011. This data comes directly from TEA. For the purpose of this study, if a school included students that were lower than grades 9-12, that school data was not included in the data.

Student achievement on the STAAR biology exam: Student passing rates on the STAAR Biology test for the 2012-2013 school year were used as the measure of student achievement on the STAAR Biology exam. In order to pass the STAAR Biology examination for the 2012-2013 school year a student had to achieve a scale score of 3,500 (Texas Education Agency, 2013c). The number of items on the examination was 54 multiple choice items (Texas Education Agency, 2013c). The number of items correct required to meet the phase-in level 1 was 20. For the purpose of this study, the percentage of students scoring a minimum of 3,500 on the exam was used as the measure of the variable.

Student mobility rate: For the purpose of this study, student mobility rate is measured using data from TEA. According to TEA, A student is considered to be mobile if he or she has been in membership at the school for less than 83% of the school year (i.e., has missed six or more weeks at a particular school). To determine a campus mobility rate the state of Texas divides the number of mobile students by the number of

students that were in membership at any time during a school year (Texas Education Agency, 2012a). The percentage of students that were considered mobile is used as the measure of student mobility rate for this study.

Student socio-economic status: Student socio-economic status was established for each campus by determining the percentage of students at each campus that are eligible for free or reduced lunch (Texas Education Agency, 2012a).

Data Analysis: Path Analysis

To analyze the data, IBM SPSS Amos 22.0.0 (Build 1384) Version 4 (Amos) was used. First, a theoretical model was proposed using the variables of interest. This model, as shown in Figure 9 previously, came from the modified best-evidence synthesis included in Chapter 2. Prior to conducting the path analysis, Pearson correlation coefficient was conducted in order to determine whether there is a significant relationship that exists between the percentage of student passing the STAAR Biology exam and the variables included in the study.

Table 2
Pearson Correlations Between the Observed Variables

	Observed Variables	N	1	2	3	4	5	6
1	Percent Passing STAAR	1029	1	-.055	-.53	.019	-.527	-.419
2	School Size	1029		1	-.029	-.567	.072	.329
3	Percent Eco-dis	1029			1	.011	.442	.736
4	Expenditure per student	1029				1	.009	-.190
5	Mobility Rate	1029					1	.262
6	Percent Non-White	1029						1

An initial model was then created using Amos to determine if there were relationships that existed between the variables in this study. That model is shown in Figure 10.

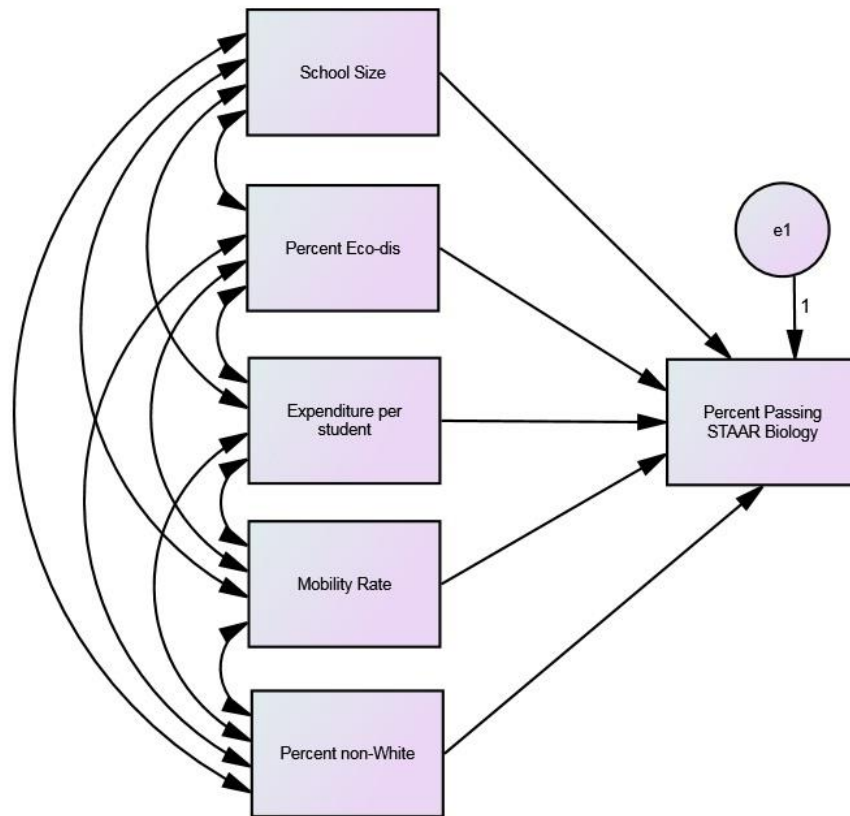


Figure 10. Initial path model..

A non-experimental quantitative research design using a correlative model (Creswell, 2012) was used. By using a path analysis, the goal was to identify the inter-correlation between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students on students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance and the impact of such inter-correlation on students' STAAR Biology achievement.

The predictor variables that were used in the path analysis were Schoolsiz (School Size), Peecodis (Percent Economically-Disadvantaged), expperst (Expenditure

Per-Student), mobrate (Mobility Rate); and nonwht (Percent Non-White). The criterion variable that was used was Ppasstar (Percent passing the STAAR). Path analysis was used to evaluate the relationship among the variables in the hypothesized model. The first step in this study was to examine the relationship between the variables included in the study. Next, path analysis was performed by using SEM in Amos in order to investigate the effects of the predictor variables on the criterion variable.

Results from Initial Model

Results from the initial model are shown in Figure 11. All of the variables were tested to see what, if any, relationship existed between the predictor (exogenous) variables and any predictive power of these variables on the criterion (endogenous) variable of percent passing the STAAR Biology exam. The results of the initial path analyses in Table 2 showed correlations that existed between all of the predictor variables. Only three of these correlations were not statistically significant, i.e., mobrate and exprrerst, expprest and Peecodis, and Peecodis and Schoosiz.

The results of the initial path analyses revealed that school size and expenditure per student have a correlation of zero as evident in the table below with both variables having a correlation of .000. The variable with the highest correlation with percent passing the STAAR Biology exam was mobility rate. The correlation between those variables was positive ($r = .709$). The next variable was percent of economically disadvantaged and it had a negative correlation with percent passing the STAAR Biology exam ($r = -.149$). The last variable that had a correlation with percent passing the STAAR Biology exam was percent non-White. Their correlation was negative as

well ($r = -.042$). These relationships demonstrated that school size and expenditure per student have zero impact on the passing percentage of students on the STAAR Biology exam as well as the other three variables have a negative correlation with the same variable. Table 3 shows all of the relationships.

Table 3

Correlations Between Predictor Variables from Initial Path Analysis

Variable Name/Correlation	Variable Name	Estimate	P
nonwht ↔ Schoosiz	Schoosiz	.329	***
nonwht ↔ Peecodis	Peecodis	.736	***
nonwht ↔ expperst	expperst	-.190	***
nonwht ↔ mobrate	mobrate	.262	***
mobrate ↔ expperst	expperst	.009	.762
mobrate ↔ Peecodis	Peecodis	.442	***
mobrate ↔ Schoosiz	Schoosiz	.072	.021
expperst ↔ Peecodis	Peecodis	.011	.724
expperst ↔ Schoosiz	Schoosiz	-.567	***
Peecodis ↔ Schoosiz	Schoosiz	-.029	.354

Note. *** $p < .001$

The next piece of the initial path analysis in Table 4 revealed that school size and expenditure per student have a non-significant ($ps > .05$) impact on the criterion. The variable with the highest predictive power on percent passing the STAAR Biology exam was mobility rate with a path coefficient of $-.709$ ($p < .001$). The second strongest predictor on percent passing was percent of economically disadvantaged and it had a

negative path coefficient of $-.149$ ($p < .001$). The last variable that had a statistically significant impact on percent passing the STAAR Biology exam was percent non-White with a path coefficient of $-.042$ ($p = .012$).

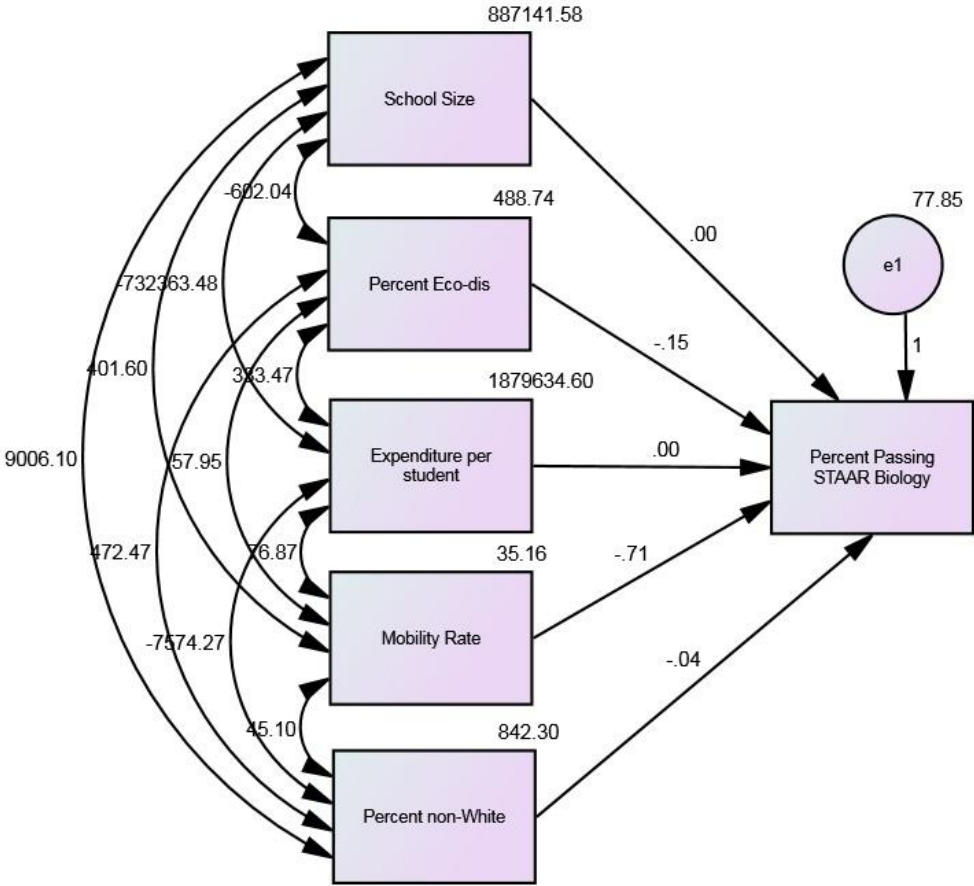


Figure 11. Initial model with results.

Table 4

Regression Weights from the Initial Path Analysis

		Estimate	S.E.	C.R.	P
Schoosiz	Ppasstar	.000	.000	.065	.948
Peecodis	Ppasstar	-.149	.022	-6.683	***
expperst	Ppasstar	.000	.000	.207	.836
mobrate	Ppasstar	-.709	.053	-13.383	***
nonwhit	Ppasstar	-.042	.017	-2.510	.012

Note. *** $p < .001$.

Results from Final Model

In the next step, the model was modified to include only those variables that had a statistically significant impact on the percent of students passing the STAAR Biology exam. The final model of the path analysis in Amos is shown in Figure 12.

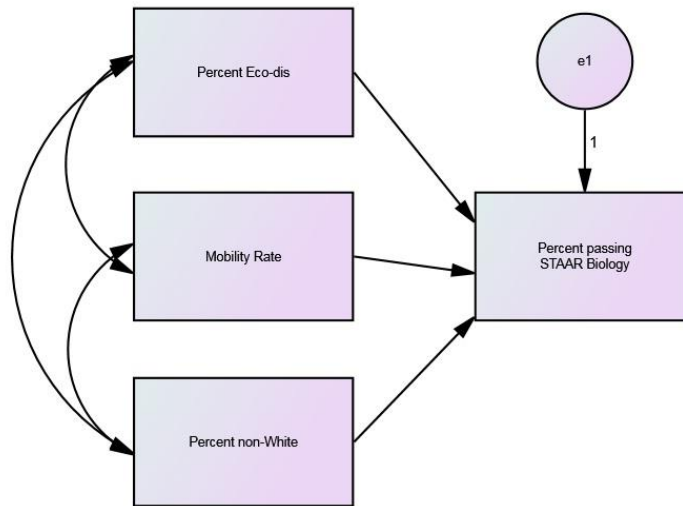


Figure 12. Final model of the path analysis in Amos

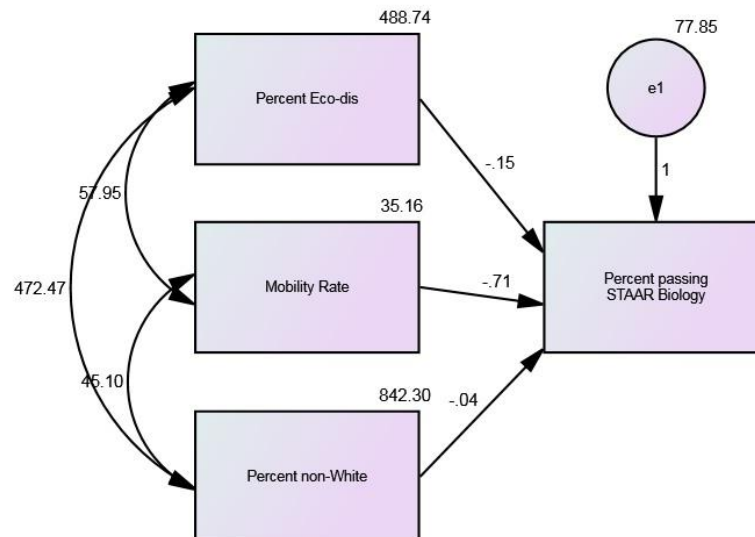


Figure 13. Final path model with results.

Table 5 presents the correlations between the predictor variables in the final path model. Additionally, Table 6 shows the regression weights from the final path analysis.

Table 5

Correlations Between Predictor Variables from the Final Path Analysis

Variable Name/Correlation		Variable Name	Estimate
nonwht	↔	Peecodis	.736
nonwht	↔	mobrate	.262
mobrate	↔	Peecodis	.442

Note. *** $p < .001$.

Table 6

Regression Weights from the Final Path Analysis

		Estimate	S.E.	C.R.	P
Peecodis	Ppasstar	-.149	.020	-7.486	***
mobrate	Ppasstar	-.709	.052	-13.621	***
nonwht	Ppasstar	-.042	.014	-2.995	.003

Note. *** $p < .001$.

Overall, the results of the two path analyses performed in this study reveal that the variable that has a statistically significant impact on student performance on the STAAR Biology exam is mobility rate with a path coefficient of $-.709$ ($p < .001$). This correlation score did not change within both models. The approximate σ changed for

mobility rate from the initial model to the final model. In the initial model, covariance estimate was -13.383 while in the final model it was -13.621. Percent economically disadvantaged was the second strongest predictor variable on student performance on the STAAR Biology exam with a path coefficient of $-.149$ ($p < .001$) in both models. The covariance estimate changed slightly from $.022$ in the initial model to $.020$ in the final model. The last variable that was investigated in both models was percent non-White with a path coefficient of $-.042$ ($p < .01$) in both models. The covariance estimate changed slightly from $.017$ in the initial model to $.014$ in the final model.

Research Questions Answered

1. Does school size impact student achievement on the STAAR Biology exam? The results of the initial model show that school size is not a significant predictor on student achievement on the STAAR Biology exam. The p value in the path coefficient is $.948$ and that is why school size was removed as a variable for the final model.

2. Does student socio-economic status impact student achievement on the STAAR Biology exam? Student socio-economic status was the variable that had the second highest predictive power in both models. This demonstrates that student socio-economic status on a campus negatively impacts student performance on the STAAR Biology exam for the 2012-2013 school year.

3. Does per pupil expenditures impact student achievement on the STAAR Biology exam? The results of the initial model show that there was no predictive power of school size on student achievement on the STAAR Biology exam. The non-significant p value

of .836 demonstrated this and that is why school size was removed as a variable for the final model.

4. Does student mobility rate impact student achievement on the STAAR Biology exam? Student mobility rate was the variable that had the highest impact in both models. This demonstrates that student mobility rate on a campus negatively impacts student performance on the STAAR Biology exam for the 2012-2013 school year.

5. Does percentage of non-White students impact student achievement on the STAAR Biology exam? Percentage of non-White students was the third strongest predictor in both models. This demonstrates that percentage of non-White students on a campus negatively impacts student performance on the STAAR Biology exam for the 2012-2013 school year.

6. What relationship, if any, exists between school size, student socio-economic status, per pupil expenditures, student mobility rate, and percentage of non-White students? All of this portion comes from the initial model because of the removal of school size and expenditure per student from the final model. School size had a positive correlation between percentage of non-White students ($r = .329$). School Size also had a significant positive correlation with student mobility rate ($r = .072, p = .021$). School size had a negative correlation with expenditure per student $r = -.567, p < .001$. The last relationship investigated involving school size was percent economically disadvantaged. This relationship was negative ($r = -.029$) and statistically non-significant ($p = .354$). Percent economically disadvantaged and percent non-White had a positive and statistically significant correlation with each other, ($r = .736, p < .001$). This was the

highest of all correlations between all of the predictor variables. Percent economically disadvantaged and student mobility rate also had a positive and significant correlation ($r = .442, p < .001$). The last variable that had any correlation with percent economically disadvantaged was expenditure per student. The correlation between these two variables was statistically non-significant, ($r = .011, p = .724$). Expenditure per student was a variable that had mixed results in regard to correlation with other variables. In regard to percent non-White, expenditure per student had a negative correlation ($r = -.190, p < .001$). This is a fairly strong negative correlation. The last relationship that expenditure per student had was with mobility rate. The correlation was statistically non-significant ($r = .009, p = .762$). The last correlation that was investigated in the initial path analysis was mobility rate and percentage of non-White students. This correlation was positive and statistically significant ($r = .262, p < .001$).

CHAPTER IV

WHAT IS KNOWN ABOUT THE LINK BETWEEN SCHOOL SIZE, SOCIO-ECONOMIC STATUS, EXPENDITURE-PER-STUDENT, MOBILITY RATE, PERCENTAGE OF NON-WHITE STUDENTS, AND STUDENTS'S STATE OF TEXAS ASSESSMENT OF ACADEMIC READINESS (STAAR) BIOLOGY EXAM PERFORMANCE

Introduction

Today's students in Texas are tested more than students of the past. These students are also struggling to pass these tests (Texas Education Agency, 1998, 2013a). The average student in Texas has changed dramatically over the past 15 years as well (Texas Education Agency, 1998, 2013a). This has caused an achievement gap in schools today. There is an achievement gap that exists between White and Asian students and African American and Hispanic students. (Evans, 2005). In the United States, this problem is pressing because by the year 2020 it is hypothesized that most students in the United States will be Hispanic (Murdock, 2010).

The purpose of this policy brief is to inform policy makers, school board members, as well as school administrators about the importance of student achievement in schools and what impacts this. Being able to determine what variables have an impact on student performance will allow decisions to be made with student performance at the fore front in education.

This policy brief provides information about the following questions:

- Question 1- What is included in the literature about the relationships that exist between school size, socio-economic status, expenditure-per-student, mobility-rate, percentage of non-main stream students, and students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance?

- Question 2- What do the results of the Barton Study include about the relationships that exist between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students, and students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance?

This brief will conclude with some policy recommendations based on the areas mentioned in the two questions.

Question 1

The body of literature about school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students, and student academic achievement is very broad. When initial search was performed before limiting parameters, 32,036 citations were found. For my modified best-evidence synthesis, I researched all of the above variables but I limited the research to studies that took place in the United States, grades 9-12, were quantitative in nature, and studies that took place in the year 1990 or later. Once these limitations were put in place there were only 14 articles that fit my model.

School Size Related to Student Achievement

There were three articles that related to the topic of school size and student achievement that were included in the modified best-evidence synthesis. Fowler and Walberg (1991) conducted a study with New Jersey data that used ninth graders' data from the 1984-1985 school year. There were many variables that the researchers investigated and they ran regression equations to determine the relationships that the variables had on one another. Their study revealed that school size was negatively related to student performance. This means that the larger the school, the worse the student performance was. McMillen, Zhang, Cobb, Williamson, Kaase, Williams, and Fiefs (2000) performed a study that analyzed test scores for Kindergarten through fifth grade schools, sixth to eighth grade schools, and ninth to twelfth grade schools in the state of North Carolina. The only portion that was used for the modified best-evidence synthesis was the section about students in grades nine-twelve. North Carolina End of Course data was used from the 1998-1999 school year. The researchers performed a correlation analysis. This study revealed that school that were larger had lower student performance. Stewart (2009) performed a study using Texas data from the 2005-2006 school year. The researcher used Texas Assessment of Knowledge and Skills (TAKS) data to investigate the relationship between high school size and student performance on the TAKS. The University Interscholastic League (UIL) has five categories in the State of Texas that break down high schools by size. Stewart used these 5 size categories were used to compare their performance on the TAKS. The researcher took the students' exit-level TAKS performance and compared that by high school size to determine if high

school size impacts student performance. Overall the data from the research study showed that students in smaller schools are performing better on the TAKS test. Overall, these articles demonstrated that students in smaller schools perform better on standardized tests.

Socio-economic Status Related to Student Achievement

There was only one article that related directly to socioeconomic status (SES) and student performance. Caldas and Bankston (1997) conducted study using Louisiana testing data from the 1990 school year. The researchers used the Louisiana Graduation Exit Examination (GEE) scores in mathematics, English language arts, and written composition components to measure student achievement for the study. They used the data from 42,041 tenth grade student that took the GEE during the 1990 school year. The researchers performed a principal-component analysis on the raw mathematics, language arts, and written composition scores and they used the output of the weighted factor as the dependent variable of student achievement, School-level measures of SES, Individual-level control variables, and School-level control variables. They also used a series of OLS regressions to show the effect of each variable on student achievement. The results of the study show that the poverty status of students had a statistically significant negative impact on student achievement on the GEE. This study showed that more students on a campus that have a lower SES have a lower achievement on standardized tests.

Per Pupil Expenditure Related to Student Achievement

Two articles were found that were related to per pupil expenditure and student achievement. The first study that was used in my modified best-evidence synthesis was by De Luca and Hinshaw (2013). They used data from 2009-2010 school year from the schools in Ohio. The students that were involved in the study were the tenth graders that take the graduation assessment. The independent variables in this study were the percent of total district expenditure for administration, building operations, instruction, pupil support, and staff support. The results of this study showed that there was not a very large relationship between spending per student and student performance. Jones and Slate (2010) performed a similar study that looked at the relationship between expenditure per student and performance on the TAKS test. They used data from Texas school from the 2007-2008 school year. The researchers performed a multivariate analysis of variance (MANOVA) as well as Scheffe post hoc procedures for the subgroups all students, African-American students, Hispanic students, and White students. The results of the study show that schools that spend less on instructional expenditures perform worse on the TAKS test than schools that spend more on them. Overall, the two studies from this section show that spending more on instruction leads to better student performance.

Mobility Rate Related to Student Achievement

There was one article that pertained to mobility rate and student achievement. The study that was included in the best modified evidence-synthesis was by Engec (2006). It took place in Louisiana and it used data from the 1997-1998 and 1998-1999

school years. The researcher used public school data from grades K-12. Iowa Test of Basic Skills (ITBS) test data is what the researcher used to establish student performance for the study. Engec used one-way analyses of variance (ANOVAs) and analyses of covariance (ANCOVA) to conduct the study. The results of this study show that there is a negative relationship between ITBS test scores and the number of moves that a student makes.

Non-White Students Related to Student Achievement

There are two articles that were included in the modified best-evidence synthesis. Sanchez, Ehrlich, Midouhas, O'Dwyer, and Regional Educational Laboratory Northeast and Islands (ED) (2009) performed a study in Massachusetts to examine the performance of tenth grade Hispanic students on the Massachusetts Comprehensive Assessment System (MCAS) tests in English Language Arts and Math. The researchers conducted the study using data from the 2002-2003 to the 2005-2006 school years. They did not mention any specific data analysis procedures in this section. The results of this study show that the Hispanic students performed significantly lower than the non-Hispanic students. Trent (1997) conducted a study that used data from the St. Louis Public School district in the 1994-1995 school year to determine if Black students are performing lower than white students. The researcher also used data from a national survey that focused on the effects of race on education, employment, and attitudes. The Stanford Achievement Test (SAT) math and reading portions were used for the study as the measure of student achievement. Trent used regression analysis for the study. The findings of this study show that there is a negative correlation between poverty

concentration and student achievement on the SAT. Both of the above studies show that schools that have a higher concentration of non-White students perform worse than schools that have a higher concentration of White students.

Multiple Variables Related to Student Achievement

There are four articles included in the modified best-evidence synthesis that related to multiple variables and student achievement. Bankston and Caldas (1998) looked at multiple variables in relationship to student achievement. The study took place in Louisiana and involved 18,310 tenth grade students. The researchers used SAS Proc Mixed to multilevel unconditional means and random coefficient models. The results of the study showed that African American students performed worse on the LEE than the white students did. They also found that students that went to schools with more African American students performed worse on the LEE than students who did not. There were other variables that were discussed but these are the two that were directly related to the modified best-evidence synthesis. The second study that discussed multiple variables was performed by Vorthmann (2011) in Missouri. The researcher performed the study to establish what the best size of schools was to get the best performance on the Missouri Assessment Program (MAP) grade level assessments as well as EOC assessments for the 2009-2010 school year. Vorthmann used a causal-comparative quantitative research design. The researcher also used a one factor ANOVA to perform the research. The results from this study show that there was a variance in achievement across all schools according to variables and school sizes. The study showed that students from schools with higher levels of poverty had lower scores on the EOCS. The next study that was

part of the modified best-evidence synthesis was conducted by Durbin (2001). The purpose of this study was to investigate the relationship between high school size, per pupil expenditure, and student achievement. This study involved all eleventh graders in 192 South Carolina public high schools. The measure for student achievement was the Metropolitan Achievement Test-Seventh Edition (MAT-7) that was administered in the spring of 1998. The researcher used multiple regression to determine the relationships between all of the variables in the study. The results of this study showed that school size impacted student achievement. The bigger the schools got, the better the students performed on the MAT-7. The last study that was included in the modified best-evidence synthesis was performed by Howley (1996). This study was performed in West Virginia to determine the relationship between school size and student performance. The researcher used performance on the Comprehensive Test of Basic Skills (CTBS). This test is administered to all students in West Virginia that are not in special education classes. The data for this study are from the 1990 school year. The researcher used regression analysis to determine the relationship between school size and achievement. The results of this study shows that school size impacts student performance in different ways depending on the variables that were included in the model. All five articles included in this section show that there are many variables that impact student performance in schools. There were two variables that were prevalent in most of these articles. School size and student socioeconomic status are both variables that have an impact on student performance.

Question 2

Using path analysis, the inter-correlation between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students with students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance was examined. Data were derived from the Texas Education Agency (TEA) for the 2012-2103 school year as well as the financial data for the 2011-2012 school year from all of the high schools in the State of Texas. There were 1,029 high schools used for this study. The variables that were used for this study are STAAR Percent at Phase-in Level II or Above End of Course Biology STAAR Achievement (Percent passing Biology STAAR exam), Total students (School Size), Percent of economically disadvantaged students, 2011-2012 Expenditure-Instruction-Per-Student (2011-2012 Expenditure per-student), 2011-2012 Mobility Rate, and Percentage of Non-White students. The results of this path analysis show that in Texas school size and expenditure per student did not impact student performance on the STAAR Biology exam for the 2012-2013 school year.

Policy/Practice Recommendations

There are two policy recommendations based on the information in this study. As well, there are four practice recommendations, and there is one research recommendation. Those recommendations follow.

Recommendations for Policy Makers

- Work on the Foundation Schools Program in the State of Texas to ensure that funding is based on the number of students and needs.

- Carefully review high school sizes in the State of Texas and the funding that is available for new constructions.

Recommendations for Administrators

- Be fully aware of the expenditures and on what the money is being spent. Make sure that the majority of the money is spent on instruction.
- Monitor the placement of students within school districts and campuses. Many times districts make students ride buses across town to adjust the ratio of low-SES students across multiple campuses to spread out the federal monies.
- Monitor the mobility status of all students to establish if they have been in the same school, school district, state, or teacher's class for that year. Also, have knowledge of the number of moves each student has to recommend remediation if they have moved multiple times.
- If a student moves within a school district that has multiple schools at all levels, the school district should bus the student to the original school that they started at that school year to ensure there is consistency for that student for that school year. The following year, they could then go to the school that they are zoned for based on attendance boundaries.

Recommendations for Researchers

- Replicate this study using data for the years after 2012-2013.
- Perform the same path analysis using English I, English II, Algebra I, and US History STAAR data as a the measure of student performance instead of Biology.

CHAPTER V

SUMMARY

My record of study was made up of two studies. The first study was a modified best-evidence synthesis that examined the relationship among school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students on student science exam performance. The second study was a path analysis study that identified the inter-correlation between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students on ninth grade students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance and the impact of such inter-correlation on students' STAAR Biology achievement.

Findings from both of the studies performed as part of my record of study added to the research. One way that the modified best-evidence added to the research is that my study looked at other studies that related to American high schools that served grades 9-12. Most of the studies that were found were not specific to high schools in America. In regard to my path analysis, at the time of the study there were no other published studies that used the STAAR Biology exam as the measure of student achievement.

Findings from the modified best-evidence synthesis were presented in chapter 2. School size, socio-economic status, per pupil expenditure, mobility rate, and percentage of non-White students were all investigated in relation to student academic achievement. In regard to school size there were three studies that were found and used as part of the modified best-evidence synthesis. The overall findings from these three studies is that

students in the smaller schools in these studies performed better on the standardized tests used to measure student achievement. The next variable that was investigated in the modified best-evidence synthesis was socio-economic status in regard to student achievement. There was only one article that was included and it showed that students that are on campuses that have more economically disadvantaged students perform worse on standardized tests than students who go to schools with less economically disadvantaged students. Per pupil expenditure is the next variable that was included in the modified best-evidence synthesis. There were two articles that were found to fit the model. Both of the studies found that spending more on instruction equals better student performance. There was one article that related to mobility rate and student performance for the modified best-evidence synthesis. This study demonstrated that students that move more perform worse on standardized tests. The next variable that was explored in the modified best-evidence synthesis was the percentage of non-White students on a campus. There were two articles that were used and they both showed that students that go to schools with a lower percentage of White students perform worse on standardized tests. The last portion of my modified best-evidence synthesis included studies that looked at multiple variables related to student performance. There were five articles that were used for this portion of the study. The overall theme that was prevalent in these articles is that students that school size and student socioeconomic status had the largest impact on student performance. In regard to school size, students that were in larger schools performed worse than students in small schools. Overall, the modified best-

evidence synthesis showed that all of the variables used in the study impacted student performance. There were no steadfast certainties that were the result of the study.

The findings from the path analysis were presented in chapter 3. A path analysis study was performed to examine the inter-correlation between school size, socio-economic status, expenditure-per-student, mobility-rate, and percentage of non-main stream students on ninth grade students' State of Texas Assessment of Academic Readiness (STAAR) Biology exam performance and the impact of such inter-correlation on students' STAAR Biology achievement. After performing the path analysis, it was found that two of the five variables had .000 correlation with passing the STAAR Biology test for the 2012-2013 school year. These variables are school size and expenditure per student. These are the two variables that were unsure before the path analysis was ran, but it was discovered that they do not impact student performance at all. In regard to the other three variables and their relationship with student achievement, mobility rate had the highest correlation with a negative correlation of $-.709$. Percent economically disadvantaged was the second highest correlation with a correlation of $-.149$. The lowest correlation with student achievement was percent non-White with a correlation of $-.042$. The three negative correlations were not a surprise in regard to impacting student performance on the STAAR testing. Many of the studies used for the modified best-evidence synthesis related to these three variables. Overall, the outcome of this study was a bit surprising because it was assumed that school size and expenditure per student would have a correlation with student performance.

In conclusion, the achievement gap that exists in American schools today's schools is very concerning to educators across the nation. It is imperative that policy makers, educators, and researchers take a careful look at the disparity that exists in student performance across student groups and act accordingly. In closing, students of color that are living in poverty will no longer be in the minority in regard to the population of the United States by the year 2020 (Murdock, 2010). As a result, it is imperative that all involved in education decision making look at all avenues to ensure that all students are successful.

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